World Meteorological Organization (WMO)
Regional Association Europe (RA VI) Regional Climate Centre (RCC) Network Operation Plan

Version control

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Content

1 Introduction

RCCs are Centres of Excellence that assist WMO Members in a given region to deliver better climate services and products including regional long-range forecasts, and to strengthen their capacity to meet national climate information needs. The primary ‚clients' of a RCC are NMHSs and other RCCs in a Region and in neighbouring areas. RCC responsibilities should be regional by nature and not duplicate or replace services provided by NMHSs. RCCs serve the regional level of a three-level (climate-related) infrastructure: Global Producing Centres (GPCs, global level), Regional Climate Centres (RCCs, regional level), National Meteorological and Hydrological Services (NMHSs, national level).

RA VI- XIV reiterated the Region's intention to implement a RCC network consisting of functional nodes rather than one or several multifunctional centres. The nodes of the RA VI RCC Network are composed of consortia, hosted by respective lead institutions. This approach has been chosen to ensure incorporation of as much competence and know-how as possible of the 50 RA VI Members.

This document describes the RA VI approach to operate the WMO Regional Climate Centre according to Resolution 1 of RA VI-XV ‚Establishment of a Regional Climate Centre Network in Regional Association VI (Europe)'.

2 History

The evolution of the RCC concept started after the big El Niño event 1997/98. An Intercommission Task Team on Regional Climate Centres elaborated a first framework for WMO RCCs (cf. General Summary of the Session of the Intercommission Task Team on Regional Climate Centres, WMO, 2001). The next milestone was the Meeting on Organisation and Implementation of Regional Climate Centres, which provided a first guideline document on the establishment of RCCs (cf. Proceedings of the Meeting on Organisation and Implementation of Regional Climate Centres, WMO, 2003a). Supported by activities in the Regional Associations, especially RA II and RA VI, as well as by discussions and resolutions of WMO-EC, WMO-Congress and WMO-CCl, the Implementation/Co-ordination Team of CCl elaborated specific details of RCC services and the related designation process at its meeting in October 2007 (cf. CCl Implementation/ Co-ordination Team, 1st Session, report, WMO 2007b). An Ad-hoc expert group of CCl, CBS, RAs and the WMO Secretariat clarified remaining details and provided an Updated Interim Guidance on RCCs (cf. Establishment and Designation of WMO Regional Climate Centres, WCASP/WMO of 12 June 2008), published in the Manual on the GDPFS (WMO, 2010). These amendments to the Manual on the GDPFS, defining RCCs within the basic WMO infrastructure, were adopted by CBS at its fourteenth session. At that occasion, RA II successfully underwent the RCC designation procedure for both the Beijing Climate Centre and the Tokyo Climate Centre.

In WMO RA VI the Working Group on Climate-related Matters took responsibility to advice RA VI President in an appropriate RA VI RCC structure. After a multi-year development and discussion process, the RA VI RCC Implementation Meeting was held in 2008. At its 15th Session WMO RA VI established a Working Group on Climate and Hydrology (WGCH) which subsequently provided advice to the RA VI President via the RA VI Management Group.

Also, numerous RCC-related discussions took place at meetings of the EUMETNET/ECSN Advisory Committee (some ECSN projects form the nucleus of the RA VI RCC Network) as well as in the context of the elaboration of the RA VI Strategic Plan (where RCCs form a main part of climate-related activities in the Region).

A preparatory period starting with a survey in 2008 among its Members, eventually led to a product portfolio of the candidate RCC in WMO RA VI. This was transformed into an Implementation Plan that was coordinated among the Members and presented to the 15th Session of the Regional Association VI (Europe) in fall 2009 in Brussels. The WMO RA VI RCC Network formally has been established by Resolution 1 (XV-RA VI) "Establishment of a Regional Climate Centre Network in Regional Association VI (Europe)" by the 15th Session of the Regional Association VI (Europe), 18-24 September 2009, Brussels (WMO, 2009). The RA VI RCC Network Implementation Plan (Version 1.0 of 28 April 2009) has been recognized by the Resolution 1 (XV-RA VI).

Following the Resolution 1 (XV-RA VI), a pilot phase from 2009-2012 was used to implement the products and services outlined in the Implementation Plan. From late 2011 to mid-2012 a joint CCl-CBS expert team evaluated implementation and availability of the products based on the Implementation Plan, and eventually the WMO Commission for Basic Systems (CBS) in its 15th session adopted the proposal to establish Regional Climate Centre Network in Regional Association VI (Europe) with three nodes by adding the necessary information into the Manual on the GDPFS (WMO, 2010). These changes to the Manual on the GDPFS eventually have been approved by the WMO Executive Council in its 65th Session (WMO, 2013). This was the formal designation of the Regional Climate Centre Network in Regional Association VI (Europe) as a Regional Specialized Meteorological Centre (RSMC) of WMO.

In October 2016 a RCC workshop had been held to discuss performance and future functions of the WMO RA VI RCC Network (WMO, 2016a). Workshop outcomes related to new operational and highly recommended functions have subsequently been discussed in a RCC Coordination meeting (WMO, 2016b).

This Operation Plan (OP) is based on the initial Implementation Plan as recognized by Resolution 1 (XV-RA VI) with amendments proposed in the WMO RA VI Workshop on RCC Implementation and the Third Coordination meeting.

3 Feedback Mechanism

The WMO RA VI RCC Network has been established to support its Member countries through its respective NMHSs to better meeting the national obligations for providing climate information and services. In order to do so, agreeing on Implementation and Operation Plans are only first steps to meeting this goal.

In order to arrive at a continuous improvement mechanism for the services provided by the WMO RA VI RCC Network, a functioning feedback mechanism needs to be implemented and operationalized. Elements of such a feedback mechanism include:

- NMHSs inform WMO RA VI RCC Coordinator about their respective RCC and Climate Watch focal points; update of contact addresses, introduction of generic email addresses;
- Regular Network Coordination meetings with all consortium members (at least one per inter-sessional period; 12 months before RA VI Sessions);
- Regular RCC Workshops (12 months before RA VI Sessions);
- Rolling review of requirements (i.e. updating this Operation Plan); periodic questionnaires focusing on 1-2 products, possibly using RCOFs for outreach;
- Making use of RCOFs to actively collect feedback information;
- NMHSs to actively making use of online feedback form at https://rcc.dwd.de/DWD-RCC/EN/overview/contact/contact_node.html.
- Information: https://rcc.dwd.de/DWD-RCC/EN/overview/contact/contact_node.html
- Information communicated to NMHSs about RCC news via newsletters provided by the RCC Network (at least annually).

4 Key elements for the updated RA VI RCC Network Operational Plan

During the last RCC workshop in Belgrade 2016, it was agreed that it will be appropriate to move from Implementation Plan (IP) to Operational Plan (OP) for the RAVI RCC Network. This OP will take into account the general conclusions and recommendations made in in the RCC workshop with regard to:

- revision of the current mandatory and highly recommended functions;
- revision of the current structure of the RA VI RCC Network:
- improvement of access to additional observation data and products in order to improve RCC Network products and services possibly by invoking the Resolution 60 (Cg-17)
- improvement of the feedback mechanism by inter alia updating contact addresses, introducing generic email addresses, questionnaires focusing on 1-2 products, using RCOFs for outreach

The following new elements have been identified by participants to be included in the Operational Plan:

- Feedback Mechanism to continuously improve RCC products and services

    - Includes rolling review of requirements

- Improved collaboration with neighbouring RCCs with a view of improved products and services harmonization
    - e.g. neighbouring RCCs should allow for access to underlying gridded data for intercomparison
    - Arctic PRCC
- RCC in the context of relevant intergovernmental activities: these would include
    - European activities: EUMETSAT, ECMWF, Copernicus
    - This should also take into account activities within CIS and Arab League
        - NEACC for CIS and Jordan for Arab League could assess relevant conclusions and bring them to attention of RCC Coordinator
- Improved online access to RCC Network products and services
    - Single RCC web portal
    - Seamless RCC Network products and services as a long-term vision

In details for each RCC services, the following improvements have been identified for current and future activities:

Current RCC services:

- -> Data Services:
    - Daily updates of gridded data sets; Include MASH-MISH tool in ECA&D; Accelerate data set update cycles
- -> Climate monitoring services:
    - Provision of circulation indices, Use more objective criteria for climate extremes identification; Use a variety of models for Climate Watch advisory to properly catch sub-regional particularities; Teleconferences to facilitate Climate Watch advisory issuance; More consideration of soil moisture in Climate Watch Advisories; Increase number of self-explaining figures in national reports to avoid language problems; Improve methodology for extreme events analyses

- -> Long-range Forecasting:
    - Verification of seasonal forecasts; Provide a variety of models for Climate Watch Advisory to properly catch sub-regional particularities; More user friendly dissemination; Issuance of LRF bulletin at a fixed date to facilitate its operational use
- -> General:
    - Extend products to cover entire Kazakhstan; more details for Middle East; extend domain of LRF products of SEEVCCC to cover the entire territory of Ukraine;
    - Improve product quality and increase spatial resolution;
    - Harmonize monitoring and forecast products – to ensure seamless flow of information;
    - Establish national RCC Focal Points for each node to facilitate the communication;
    - More training activities;
    - Offer a choice of normals but provide a suite of RCC services based on the same normal, preferably 1981-2010 or 1961-1990 (note: new WMO approach);
    - Update data sets regularly;
    - Improve RCC product resolution over Alpine region (especially snow);
    - Consolidation of outputs from RCC Nodes into a single RCC website;

Future RCC services

- - Data services:
    - Improved regional data base of extreme weather events;
    - Gridded datasets at highest resolution (conflict with national responsibility);
    - Daily and decadal (10 days) data sets of temperature, precipitation, sea-level pressure, sunshine duration, water vapour, soil moisture, evaporation.
- - Climate monitoring:
    - Evapotranspiration products;
    - Surface wind speed, precipitation and pressure maps based on three hourly data;
    - Archive of Climate Watch Advisories;

- Verification of Climate Watch Advisories;
- Percentile and trend maps;
- Maps of heat and cold waves;
- Maps of circulation indices;
- Climate knowledge database on extreme events.

- - Long-range Forecasting:
  - More skilful monthly and seasonal forecasts including verification information;
  - Add monthly forecasts from other centres than ECMWF incl. verification information to allow for comparison;
  - Provision of digital data of operational and retrospective seasonal forecast.
- - General:
  - More quasi-real time services (indices, extremes etc.);
  - Provide gridded datasets for all disseminated products;
  - Free dissemination of open-source climate indices calculation software;
  - Harmonization of RCC and Copernicus products and services;
  - All RCC products and underlying data based on data sets starting 1981 (1961) and not necessarily relying on SYNOP (use of analysis and reanalysis);
  - Add phenology data and products;
  - Sea level data.

Priorities and schedule for its operational implementation will be fixed dependent on capacities of RA VI RCC consortium partners.

5 Collaboration with neighbouring RCCs

As some of the WMO RA VI Members' areas belong to two different Regional Associations (RAs) it is desirable to have as homogenous climate information as possible from each RA. It is therefore envisaged to work towards a mechanism by which products and services can be harmonised between RCCs in neighbouring RAs. In this regard the following activities could be helpful:

- Neighbouring RCCs should be encouraged to allow for access to underlying gridded data for comparison;

- RCOFs could be used to coordinate relevant services among concerned RCCs;
- Concerned Members are invited to inform and contact their respective responsible RCCs in case of diverging information provided;

Also with a view to work towards harmonized services and products and to avoid duplication, the RA VI RCC Network Coordinator is encouraged to ensure close collaboration especially with inter-regional RCCs like the envisaged Arctic Polar RCC (PRCC).

6 International Collaboration beyond RCCs

In this context various intergovernmental activities within WMO RA VI are relevant. These include European activities by EUMETSAT, ECMWF, and Copernicus as well as within the Commonwealth of Independent States (CIS) and Arab League.

6.1 Collaboration with European activities

Collaboration with Copernicus Climate Change Services (C3S) and other Copernicus services offering climate information is of special importance to the RCC Network, as both cover similar geographical areas and have overlapping information contents. The existing RCC Network and coordination mechanism should be redesigned towards a coordinate approach to Copernicus through the individual EU Members, thus allowing to also taking into account needs from WMO RA VI Members outside the EU.

EUMETSAT, ECMWF and EUMETNET are other European activities of relevance to the operation of the WMO RA VI RCC Network. On the global scale, global data and monitoring centres and global producing centres for long-term forecasts are important data and information bases, which are applied and refined by RCC services.

The RCC Network coordination mechanism should be used to collect and communicate requirements from WMO RA VI members that are not members of EUMETSAT, ECMWF, EUMETNET or Copernicus into relevant governing bodies of these institutions/ activities.

Coordinating the North EurAsia Climate Center (NEACC), the RCC Node-LRF/co-lead Moscow is engaged into the climate related activities in CIS and its Interstate meteorological council.

Link with RA VI RCC Network activities (via NEACC) is also considered as a part of development of a seamless approach for prediction of weather and climate hazards in the WMO Severe Weather Forecast Demonstration Project (SWFDP) for Central Asia.

7 Concluding remarks

The RA VI RCC Network structure is, in principle, flexible and open and shall be based on the respective Members' requirements. As a first extension of services, inter-RA RCCs are expected to evolve. Currently (2016) a Polar RCC (PRCC) for the Artic is under development. PRCCs for Antarctica and the Third Pole, i.e. the Himalaya are expected to follow.

Important Note: RCC Consortia are composed of institutes providing RCC-related services at regional or sub-regional levels. Many of the RA VI RCC-related services, however, are based on national contributions of NMHSs or similar institutions.

This kind of close co-operation amongst RA VI NMHSs is a basic feature of the RA VI RCC Network!

8 The RA VI RCC Network– overview information

Since its initial phase the RA VI RCC Network consists of three nodes. Each node is composed of a consortium led by a lead institution.

A RA VI RCC Network Coordinator has been established, and is provided by DWD/Germany.

A single website has been established for easier access to functions and services of the WMO RA VI RCC Network at www.rccra6.org . This website provides access to the individual sites of the three nodes and their products.

A newsletter has been set up by the RCC Node-CM at http://rcccm.dwd.de/DWD-RCCCM/EN/overview/news/news_node.html . This newsletter will be “upgraded” to become a RCC Network newsletter with input from all consortium members.

8.1 RA VI RCC de Bilt Node on Climate Data Services (RCC Node-CD)

Lead: KNMI/The Netherlands

Consortium members:

1. Météo-France/France,
2. OMSZ/Hungary,
3. MET Norway/Norway,
4. RHMS/Serbia,
5. SMHI/Sweden,
6. TSMS/Turkey

8.2 RA VI RCC Offenbach Node on Climate Monitoring (RCC Node-CM)

Lead: DWD/Germany

Consortium members:

1. Armstatehydromet/Armenia,
2. Météo-France/France,
3. KNMI/The Netherlands,
4. RHMS/Serbia,
5. TSMS/Turkey

8.3 RA VI RCC Toulouse and Moscow Node on Long-range Forecasting (RCC Node-LRF)

Joint lead: Météo-France/France and ROSHYDROMET/Russian Federation

Consortium members:

1. MET Norway/Norway,
2. RHMS/Serbia,
3. TSMS/Turkey

9 The WMO RA VI Network consortium – contact information and functions

9.1 RA VI RCC Network coordination

A WMO RA VI Network Coordinator has been offered by DWD at the beginning of the Pilot Phase, and subsequently agreed by the RCC Network Consortium Members. Contact details are

Leading institution	RCC Network Coordinator
Deutscher Wetterdienst P.O. Box 10 04 65 63004 Offenbach Germany	Mr. Stefan RÖSNER Deutscher Wetterdienst Department Climate Monitoring P.O. Box 10 04 65 63004 OFFENBACH Germany Phone: +49 69 8062 4306 Fax: +49 69 8062 3759 eMail: Stefan.Roesner@dwd.de or: rcc.cm@dwd.de

9.2 RA VI RCC de Bilt Node on Climate Data Services (RCC Node-CD)

9.2.1 RCC Node-CD Leading Institution

Leading institution	Focal Point
Royal Netherlands Meteorological Institute (KNMI) P.O. Box 201 3730 AE De Bilt The Netherlands	Mr. Gé VERVER Department Climate Services P.O. Box 202 3730 AE De BILT The Netherlands Phone: +31 30 22 6444 Fax: +3130 22 10407 eMail: ge.verver@knmi.nl

9.2.2 RCC Node CD Consortium members

Consortium members	Focal Point
Météo-France 1, quai Branly 75340 Paris Cedex 07 France	Mr. Patrick JOSSE Météo-France DClim DCSC/D 42, av. G. Coriolis 31057 TOULOUSE cedex 1 France Phone: +33 5 61 07 83 00 Fax: +33 561078309 eMail: patrick.josse@meteo.fr

Meteorological Service of the Republic of Hungary (OMSZ) P.O. Box 38 H 1525 BUDAPEST 114 Hungary	Ms. Zita BIHARI OMSZ P.O. Box 38 H 1525 BUDAPEST 114 Hungary Phone: +36 1 346 4727 Fax: +36 1 346 4629 eMail: bihari.z@met.hu
Norwegian Meteorological Institute (MET Norway) P.O. Box 43 Blindern 0313 Oslo Norway	Mr. Hans Olav HYGEN MET Norway Climatology Department P.O. Box 43 Blindern 0313 OSLO Norway Phone: +47 22 963 208 Fax: not in use anymore eMail: hans.olav.hygen@met.no
Republic Hydrometeorological Service of Serbia (RHMSS) Kneza Viseslava 66 11030 Belgrade Serbia	Mr Goran PEJANOVIC Republic Hydrometeorological Service of Serbia Kneza Viseslava 66 11030 BELGRADE Serbia Phone: +381 11 2066900 Fax: +381 11 3050 847 eMail: goran.pejanovic@hidmet.gov.rs office@hidmet.gov.rs
The Swedish Meteorological and Hydrological Institute (SMHI) SE-601 76 Norrköping Sweden	Mr. Ilmar KARRO SMHI SE-601 76 NORRKÖPING Sweden Phone: +46 114 95 84 16 Fax: +46 114 95 80 01 eMail: ilmar.karro@smhi.se
Turkish State Meteorological Service P.O. Box 401 Ankara Turkey	Mr Serhat SENSOY Ms Basak YAZICI Engineer in Climatology Division Turkish State Meteorological Service BestepeMah AlparslanTürkes Cad No 71 Yenimahalle, ANKARA Turkey Tel: + 90 312 2032744 Mobile: + 90 535 9723305 eMail: ssensoy@mgm.gov.tr Or: serhatsensoy@gmail.com byazici@mgm.gov.tr

9.2.3 RCC Node-CD: Service provision overview and operational data services

Function/ Activity /Criteria	Product/ Service	Producer	Areal coverage	Time of issuance	Mean of service provision	Remarks
Regional datasets	ECA/D dataset updates from GTS-SYNOP	Host: KNMI, Netherlands	RA VI	monthly	Website	GTS-SYNOP daily quality controlled data of temperature, precipitation, pressure, snow depth, humidity, cloud cover, sunshine. Approx. 10000 data series for 2700 stations. Data handling where applicable via VGISC/WIS protocol, service also available for Northern RA I.
	ECA/D dataset updates with high quality time series provided by ECA&D partners	Host: KNMI, Netherlands	RA VI	Once per 6 months (tbd)	Website	No GTS data. Series provided by ECA&D partners, replacing GTS data Parameters: temperature, precipitation, pressure, snow depth, humidity, cloud cover, sunshine. service also available for Northern RA I
	Standardized set of 42 extremes indices for ECA/D series in the form of tables, graphs, and maps	Host: KNMI, Netherlands	RA VI	monthly	Website	Related to TT and RR. Resolution monthly, sub-annual and annual. Other indices following WMO-CCl/CLIVAR/JCOMM ETCCDI definitions. Service also available for Northern RA I
	ECA/D dataset station metadata	Host: KNMI, Netherlands	RA VI	available	Website	Following WMO guidelines. Service also available for Northern RA I
	MILLENNIUM dataset	Host KNMI, Netherlands	RAVI	available	Website	Monthly aggregations of the temperature and precipitation series of ECA/D daily data set

	ENSEMBLES Gridded Dataset E-OBS (TT, RR)	Host: KNMI, Netherlands	RA VI	available	Website	Spatial resolutions of: 0.25x0.25°and 0.5x0.5° (regular lat./long), 0.21x0.21° and 0.42x0.42° (rotated grid coinciding with model grids)). The EOBS dataset will be incorporated in the Copernicus Climate Change Service. Resolution will be increased to 0.11x0.11°
	South East European gridded model datasets for 1951-2100	SEEVCCC, host: RHMS, Serbia	Southeast Europe	available	Website	Parameter: TT, RR, wind, pressure, humidity, soil moisture, cloud cover, radiation etc., hydrological variables, oceanographic variables
	Eastern Mediterranean dataset	Host: TSMS, Turkey	Eastern Mediterranean	available	Website	Parameter: TT, RR (ERA40 gridded data set) Resolution: 2.5x2.5 Ref. Period: 1961-1990
	BALTEX hydrological dataset	Host: SMHI, Sweden	Baltic Sea drainage basin	available (irregular updates)	Website	Terms of use to be clarified with BALTEX; Various meteorological and hydrological parameters
	BALTEX oceanographic dataset	Host: SMHI, Sweden	Baltic Sea region	available (irregular updates)	Website	Terms of use to be clarified with BALTEX; Various oceanographic parameters
	BALTEX radar dataset	Host: SMHI, Sweden	BALTRAD network area and Baltic Sea drainage basin	available (irregular updates)	Website	Terms of use to be clarified with BALTEX; Various radar parameters
	SHARK dataset	Host: SMHI, Sweden	Baltic Sea region	available	Website	Parameter: water temperature, salinity, oxygen content, sea level

Climatology from global reanalysis	CARPATCLIM-DANUBECLIM dataset ERA Interim climatology	JRC; Host: RHMSS : Meteo-France	Carpathian, Global, Europe and Danube Region, Atlantic basin	available	LRF Website	Parameter: 16 climatological parameters and 37 climate indices.Parameters : T2m, T1000, T850, SLP, Z500 Geopotential
Provision of database and archiving services	Safe, recoverable storage of all ECA/D and RCC-related datasets	Host: KNMI, Netherlands	RA VI	Once per 6 months (tbd)	Website/ftp	Service available for all partners. Data rescue support. Service on the basis of existing EAC/D data.
	Upload and data management toolkit	Host: KNMI, Netherlands	RA VI	available	Website	All partners to be provided with toolkit to pre-process national datasets
Information and guidance on methodologies and products		All producers				All RCC-services to be described by the related producer.
	Guidance on homogenisation	Host: HMS, Hungary	RA VI and beyond	available	(via HMS)	Seminars, software, documentation
	QC-procedures	Host: KNMI, Netherlands	RA VI and beyond	available	Website	Seminars, software, documentation
Co-ordination of training	Guidance on the use of climate indices and DARE	Co-ordinating Institution: KNMI, Netherlands	RAVI and beyond	available	(on request)	Seminars, software, documentation
	Training course "Climatology, Foundation for Climate Services"	Host : Météo-France, France	RAVI and beyond	yearly	Training course	Alternatively in French and in English http://www.wmo.int/gfcs/node/693

9.2.4 RCC Node-CD: highly recommended RCC functions related to climate data

(to be specified later)

9.2.4.1 *Non-operational data sets and tools*

- Climate Explorer (data retrieval and analysis tool, host: Netherlands): http://climexp.knmi.nl/start.cgi?someone@somewhere
- HISKLIM (recovered historical instrumental datasets, host: Netherlands): http://www.knmi.nl/klimatologie/daggegevens/antieke_wrn/index.html
- NORDKLIM Dataset (Nordic monthly in situ dataset, hosts: Sweden, Norway): http://blog.fmi.fi/nordmet/sites/blog.fmi.fi.nordmet/files/Nordklim_data_set_v2_0_2015.xls
- SEEVCCC (provision of gridded data sets on climate projections, host Serbia) on demand at: wis-geo.hidmet.gov.rs
- MEDARE (data rescue portal Mediterranean and Balkan area, host: Spain): http://www.omm.urv.cat/MEDARE/index.html

9.2.4.2 *Co-ordination functions*

Considering activities/services of the following initiatives:

- Copernicus Climate Change Service, coordinated by ECMWF. Relevant service elements are data rescue, regional and global reanalyses, regional and global gridded ECVs based on in-situ data, satellite observed ECVs, monthly and yearly reports on the state of the European climate, downstream climate services, operation of a climate data store,
- EUMETNET Operational Services activity, focus on NMHS observational data and monitoring, Responsible Member Netherlands,
- ECA/D (European Climate assessment and data set, host: Netherlands),
- CCl ET on CCD (ECA&D indices following ET recommendations, host Netherlands),
- SEEVCCC (South East European Framework Action Plan for Adaptation, host: Serbia).

9.2.4.3 *Training and capacity building*

Considering activities/services of the following initiatives:

- SEEVCCC training in data management, climate modelling and interpretation of model outputs (host: Serbia)
- Series of homogenisation seminars (host: Hungary)
- Conference on Interpolation (host: Hungary)
- Strip digitiser: provision of software and expertise (host: Hungary)

- Biennial conferences with sessions on applied climatology: EMS/ECAC and EMS/ECAM
- Biennial data management workshops: ECSN/DMWS

9.2.4.4 *Research and development*

The RCC/ECA&D research and applications agenda addresses the following questions: (jointly with RCC Node-CM):

- How does climate change manifest itself in Europe?
- Is the probability of extremes changing and how should this be assessed?
- How good are climate models and reanalyses when they are confronted with observations?
- Optimization of QC procedures
- Research and Development of homogenisation procedures for daily observations
- Development of an ensemble interpolation scheme
- Promote studies of regional climate variability and change, predictability and impact in the Region and sub-regions (Netherlands, Norway, Serbia)
- Promote the use of proxy climate data in long-term analyses of climate variability and change (Netherlands, Norway)
- Climate R&D agenda, esp. on downscaling methods (Norway, Serbia, Sweden, Turkey, Netherlands) and climate models (Serbia-SEEVCCC)

9.2.5 Short product/service description

(methodology, spatial/temporal resolution, quality indicators, validation etc.)

Product/Service	**Methodology, spatial/temporal resolution, quality indicators, validation etc.**
ECA&D dataset updates from GTS-SYNOP	**Methodology:** monthly recovery from ECMWF MARS-Archive for updating > 11000 series (> 6000 temperature (mean, max, min), > 2700 precipitation, > 600 air pressure, > 700 snow depth, > 400 relative humidity, > 400 cloud cover and > 400sunshine duration series) **Spatial resolution:** dependent on variable **Temporal resolution:** daily **Quality indicators/Validation:** automatic flagging as useful, suspect, missing of all data **References:** - Klein Tank et al, Daily dataset of 20th-century surface air temperature and precipitation series for the European Climate Assessment, Int. J. Climatol. 22: 1441-1453 (2002). - Klein Tank, A.M.G., Algorithm Theoretical Basis Document (ATBD), project document, version 5, KNMI, 39 (2008): http://www.ecad.nl/documents/ecad_atbd.pdf. - ECA&D FAQ: http://www.ecad.eu/FAQ/index.php#3 . - ECMWF, User Guide User Support Operations Department, ECMWF Technical Notes, ECMWF Reading. (2006)
ECA&D dataset updates with QC time series provided by ECA&D partners	**Methodology:** Twice a year update retrieval from partners for above listed > 7000 series **Spatial resolution:**>variable **Temporal resolution:** daily **Quality indicators/Validation:** Outcomes of 4 peer reviewed absolute homogeneity tests: Standard Normal Homogeneity Test, Buishand Range Test, Pettit Test and the Von Neumann Ratio Test leads to three classes of homogeneity of all series: useful, doubtful and suspect. **References:** - Wijngaard, J.B., A.M.G. Klein Tank and G.P. Können, Homogeneity of 20th century European daily temperature and precipitation series, Int. J.

	Climatol., 23: 679-692 (2003) - Klein Tank, A.M.G., Algorithm Theoretical Basis Document (ATBD), project document, version 5, KNMI, 39 (2008): http://eca.knmi.nl/documents/ecad_atbd.pdf - ECA&D data dictionary: http://eca.knmi.nl/dailydata/datadictionary.php - ECA&D FAQ: http://eca.knmi.nl/FAQ/index.php#5 .
Standardized set of extremes indices for ECA&D series	**Methodology:** The indices follow the definitions recommended by the CCl/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI) **Spatial resolution:**>: variable **Temporal resolution:** monthly, sub-annual, annual **Quality indicators/Validation:** **References:** - ECA&D indices dictionary: http://eca.knmi.nl/indicesextremes/indicesdictionary.php - ECA&D indices comparison table: http://eca.knmi.nl/documents/ETCCDMIndicesComparison.pdf
ECA&D dataset station meta data	**Methodology:** Identification of all ECA&D stations: latitude, longitude, elevation, WMO identifier, GCOS identifier, ECA identifier. If known as site information: land use, soil type, surface coverage, terrain roughness class, relocations, instrumental changes and picture surroundings of station. Follows WMO recommendations **Spatial resolution:**>variable **Temporal resolution:** na **Quality indicators/Validation:** coverage ca. 10% of all ECA&D stations. **References:** - Klok, E.J. and A.M.G. Klein Tank, Updated and extended European dataset of daily climate observations, Short Commun., Int. J. Climatol. (2008) - WMO Guide (no. 8) to Meteorological Instruments and Methods of Observation

	- WMO Guide (no. 100) to Climatological Practices
ENSEMBLES gridded dataset E-OBS	**Methodology:** statistical downscaling of ECA&D series with a three step procedure (1. monthly interpolation, 2. interpolation daily anomalies, 3. combining 1. and 2.) **Spatial resolution:** 0.25x0.25°and 0.5x0.5° (regular lat./long), 0. 21x0.21° and 0.42x0.42° (rotated grid coinciding with model grids) **Temporal resolution:** daily **Quality indicators/Validation:** interpolation uncertainty quantified by provision of daily standard errors. **References:** - Haylock, M.R., N. Hofstra, A.M.G. Klein Tank, E.J. Klok, P.D. Jones, M. New., A European daily high-resolution gridded dataset of surface temperature and precipitation. J. Geophys. Res (Atmospheres), 113 (2008)
SE-European gridded model datasets	**Methodology:** dynamical downscaling of global reanalyses and Global Climate Models, with various CO2 scenarios (1951-2100) using an interactively coupled atmosphere-ocean regional climate model. **Spatial resolution:** Atmospheric: 0.25°C (~30km) in horizontal and 32 vertical levels; Ocean: 0.2°C and 21 vertical levels **Temporal resolution:** Atmospheric: 6 hours; Ocean: 5-day averages **Quality indicators/Validation:** quantified using standard statistical methods (comparison with observations) **References:** - S.Gualdi, B.Rajkovic, V.Djurdjevic, S.Castellari, E.Scoccimarro, A.Navarra, M.Dacic, 2008: SINTA Project: Simulation of climate change in the Mediterranean area. Final Scientific Report. http://www.hidmet.gov.rs/SINTA-1/SINTA_FInal Science Report _October 2008.pdf or - http://www.earth-prints.org/bitstream/2122/4675/1/SINTA_FInal%20Science%20Report%20_October%202008.pdf
Eastern Mediterranean dataset	**Methodology:** ECMWF ERA40 Updated TT and RR parameters for Eastern Mediterranean Region **Spatial resolution:** 2.5° x 2.5° **Temporal resolution:** monthly **Quality indicators/Validation:** ECMWF, User Guide User Support Operations Department, ECMWF Technical Notes, ECMWF Reading. (2006)

BALTEX Hydrological dataset	**Methodology:** Run-off data from stations is collected. Gridded meteorological data is calculated from synoptical stations. Global radiation is a computed. **Spatial resolution:** Run-off data consists of some 100 stations from a basic network of hydrological runoff stations covering the entire Baltic basin. The stations are selected to give a good areal coverage and to include the mouths of all major rivers. The meteorological data set covers the whole Baltic drainage basin with a grid of 1×1º. The grid extends over the area: Latitude N 49.5º - 71.5º, Longitude E 7.5º - 39.5º. **Temporal resolution:** Daily run off data from stations and monthly run-off data from stations and areas. The meteorological data set has the time resolution of UTC 00, 03, 06, 09, 12, 15, 18, 21 (for the period 19700101 -- 19770831 only 00, 06, 12, 18) **Quality indicators/Validation.** Hydrological data is quality checked and stored, but no updates are made. Data on "as it is" basis. A quality control algorithm to reject erroneous observations was built into the objective analysis scheme for the meteorological data set.
BALTEX Oceanographic dataset	**Methodology:** Sea level data and CTD-data are collected and some parameters are derived. **Spatial resolution:** Sea level data (observations) from approx. 45 stations and CTD-data from a number of locations. **Temporal resolution:** The sea level observations are available hourly/6-hourly and the monthly distribution of CTD data is available. **Quality indicators/Validation:** Responsibility for data quality lies with the data originators, although if a user identifies a problem, then the originator will be informed. This has not yet been necessary. Sea level data are collected by national agencies and quality controlled at source. Sweden, Denmark, Finland and Germany use quality control techniques which match those developed in WOCE and documented by Rickards and Kilonsky (1997) http://www.smhi.se/oceanografi/oce_info_data/SwedODC/Baltex/odcb_content.html . These techniques QC techniques are also documented in the IOC sea level manuals available at http://www.psmsl.org Because the tidal amplitude in much of the Baltic is small, quality control relies more on checks against adjacent stations than against sea level (tidal) forecasts. CTD data collected during research cruises have been quality controlled by principle investigators in line with ICES guidance. Those collected during monitoring cruises are collected by ISO 17025 accredited laboratories and quality controlled accordingly.
BALTEX Radar dataset	**Methodology:** Data from radars is collected and four products are being generated. The methodologies are briefly described at http://produkter.smhi.se/brdc/products.html **Spatial resolution:** Approx. 40 radar stations are used. http://produkter.smhi.se/brdc/

	Temporal resolution: A 12-hourly accumulated precipitation analysis is derived for the coverage area for the times 6 and 18 UTC. **Quality indicators/Validation**: An evaluation of the accumulated precipitation product's accuracy is found in the given reference. **References:** - Förland E.J et al. manual for operational correction of Nordic precipitation data DNMI Report 24/96 - Koisitinen J. and Puhakka T 1981 An improved Spatial Gauge-Radar Adjustment Technique. *Preprints 20th AMS Conference on radar meteorology.* - Michelson D.B and Koistinen J. BALTEX weather radar based products and their accuracies. - Michelson D.B et al. BALTEX Radar Data Centre Products and their Methodologies. SMHI Reports Meteorology and Climatology RMK Nr. 90. SMHI - Michelson D.B. et al. BALTEX radar achievements at the end of the main experiment. - Michelson D.B. and Sunhede D 2004 Spurious weather radar echo identification and removal using multisource temperature information. - Michelson D.B. 2004. Systematic correction of precipitation gauge observations using analyzed meteorological variables. - Michelson D. 2006. The Swedish weather radar production chain.
SHARK dataset	**Methodology:** Data (i.e. water temperature, salinity, oxygen content and sea level) is collected by SMHI. This data can be made available. http://www.smhi.se/cmp/jsp/polopoly.jsp?d=5431&l=sv Data collected by other partners can be provided links to. **Spatial resolution:** Data from a number of stations in the Baltic sea region. **Temporal resolution:** Monthly **Quality indicators/Validation:** Data collection is done by laboratories accredited to ISO 17025. Laboratory analysis is carried out by ISO 17025 accredited institutions, and inter-calibrations between laboratories carried out through the QUASIMEME programme. Quality control is in accordance with guidelines drawn up by the ICES Working Group on Marine Data Management (now WG Data and Information Management) available online at http://www.ices.dk/datacentre/guidelines/MDMguidelines/Guidelines2006update/Guidelines_for_water%20samples_v7.pdf and http://www.ices.dk/datacentre/guidelines/MDMguidelines/Guidelines2006update/Guidelines%20for%20%20CTD%20v7.pdf which in turn incorporate

	UNESCO/IOC derived standards. Data are exchanged annually with the ICES data bank, and there exists a formal procedure for correction of data problems from ICES, through SHARK and to the data originators. Data are also exchanged regionally through SeaDataNet. Data collected prior to ISO accreditation procedures has been checked according to current national quality control routines, which are those recommended by ICES. A national system of quality flags is used.
CARPATCLIM-DANUBECLIM dataset	**Methodology:** http://www.carpatclim-eu.org/pages/about / **Spatial resolution:** 0.1° x 0.1° **Temporal resolution:** daily **Quality indicators/Validation:** http://www.carpatclim-eu.org/pages/deliverables/ **References:** http://www.carpatclim-eu.org/pages/publications/
CARPATCLIM-DANUBECLIM dataset	**Methodology:** http://www.carpatclim-eu.org/pages/ about / **Spatial resolution:** 0.1° x 0.1° **Temporal resolution:** daily **Quality indicators/Validation:** http://www.carpatclim-eu.org/pages/deliverables/ **References:** http://www.carpatclim-eu.org/pages/publications/
ERA Interim Clima-tology	On line availability : http://seasonal.meteo.fr/en/content/suivi-clim-climERAI **Methodology :** Computation of climatological normals (T2m, T1000, T850, SLP, Z500) for the period 1981-2010 **Spatial Resolution :** 0.75° (full resolution ERA Interim) **Temporal resolution :** Monthly and Quarterly **Quality indicators/Validation :** See https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era-interim

9.2.6 Short description of (expected) interfaces to other RCC Nodes (to be specified later)

- Assessment products based on RCC node on data to be disseminated via RCC node on monitoring
- Provision of datasets from RCC node on data to RCC node on LRF for model validation and calibration
- SEEVCCC will partially use the dataset 1961-1990 to relate its work within the RCC node on Climate monitoring/Climate Watch

9.3 RA VI RCC Offenbach Node on Climate Monitoring (RCC Node-CM)

9.3.1 RCC Node-CM Leading Institution

Leading institution	Focal Point
Deutscher Wetterdienst P.O. Box 10 04 65 63004 Offenbach Germany	Dr Peter BISSOLLI Deutscher Wetterdienst Department Climate Monitoring P.O. Box 10 04 65 63004 OFFENBACH Germany Phone: +49 69 8062 2936 Fax: +49 69 8062 3759 eMail: peter.bissolli@dwd.de or: rcc.cm@dwd.de

9.3.2 RCC Node CM Consortium members

Consortium members	Focal Point
Armstatehydromet 54 Leo str. Yerevan, 0002 Armenia	Mr Artur GEVORGYAN Armstatehydromet 54 Leo str. YEREVAN, 375002 Armenia Phone: +374 5312 31 79 78 Fax: +374 10 53 29 52 eMail: agm86@yandex.ru
Météo-France 1, quai Branly 75340 Paris Cedex 07 France	Mr Pierre ETCHEVERS Météo-France DCSC/AVH/D 42, av. G. Coriolis 31057 TOULOUSE cedex 1 France Phone: +33 5 61 07 83 10 Fax: +33 5 61 07 83 09 eMail: pierre.etchevers@meteo.fr
Royal Netherlands Meteorological Institute (KNMI) P.O Box 201 3730 AE De Bilt The Netherlands	Mr Gé VERVER KNMI Department Climate Services P.O. Box 202 3730 AE DE BILT The Netherlands Phone: +31 30 226 448 Fax: + +31 30 2210 407 eMail: ge.verver@knmi.nl

Republic Hydrometeorological Service of Serbia (RHMSS) Kneza Viseslava 66 11030 Belgrade Serbia	Mr Goran PEJANOVIC Republic Hydrometeorological Service of Serbia Kneza Viseslava 66 11030 BELGRADE Serbia Phone: +381 11 2066 900 Fax: +381 11 3050 847 eMail: goran.pejanovic@hidmet.gov.rs office@hidmet.gov.rs
Turkish State Meteorological Service P.O. Box 401 Ankara Turkey	Mr Serhat SENSOY Ms Basak YAZICI Engineer in Climatology Division Turkish State Meteorological Service BestepeMah AlparslanTürkes Cad No 71 Yenimahalle, ANKARA Turkey Tel: + 90 312 2032744 Mobile: + 90 535 9723305 email: ssensoy@mgm.gov.tr Or: serhatsensoy@gmail.com byazici@mgm.gov.tr

9.3.3 RCC Node CM service provision overview

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
Climate diagnostic bulletins and maps	Annual Bulletin on the Climate in RA VI	Host: DWD, Germany	RA VI	End of June of next year	On-line version, website	
	Annual ‚State of the Climate' Report (BAMS/WMO), European Section	Host: DWD, Germany and responsible coordinating NMHS	RA VI	June of next year	Print version, website	
	Monthly Climate Diagnostics bulletin	Host: DWD, Germany	RA VI	Middle of next month	On-line version, website	
	Contribution to WMO statement on the status of the global climate	Host: DWD, Germany, coordinating contributions from RA VI NMHSs	RA VI	End of January of next year	On-line version, website	

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
	Monthly maps and anomalies of mean TT, SST**, RR*, drought index*,sea level pressure**, sunshine duration***, snow cover***, water vapour***, cloud coverage***, solar radiation components***, soil moisture*** Daily maps of maximum and minimum TT*	Host: DWD, Germany	RA VI, Water vapour: 60W-60E, 30N-80N Cloud coverage: 60W-60E, 30N-60N	Middle of next month	Website	* land areas only ** model based analysis *** satellite based analysis
	Monthly maps of Z500, MSLP, T2meters, T1000hPa, T850hPa, , (model based) and anomalies + 3 months + daily weather regimes and modes of variability	Météo-France, France	Global, RA VI	Daily update with D-1 data	Website	Basis: ECMWF reanalysis and ERA-Interim climatologies
	ECA&D based maps, graphs and trends (TT, RR, extremes indices), based on station data and gridded data)	Host: KNMI, Netherlands	RA VI	Once per month and ad hoc on demand (extreme events)	Website	service also available for Northern RA I Integration into RCC Node-CM website still pending.

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
	Monthly and seasonal maps of TT, RR	SEEVCCC, host: RHMS, Serbia	Southeast Europe	Second week of the month for previous month and season	Website	Observed values and anomalies
	Monthly NCEP/NOAA/NCAR analysis	SEEVCCC, host: RHMS, Serbia	Northern Hemisphere	First week of the month for previous month	Website	Various upper air and surface parameters, teleconnection indices, blocking
	Monthly maps of TT, RR	TSMS, Turkey	Eastern Mediterranean	End of month for previous month	Website	Data source: TSMS and JMA
	Monthly anomaly maps of TT, RR	Armstatehydromet, Armenia	South Caucasus region	Second week of the month for previous month and season	Website	Based on NCEP/NCAR reanalysis and CMAP or CAMP_OPI
	Display of national monthly maps of TT, RR, sunshine duration (means/sums and anomalies) from NMHSs in RA VI in the RCC Node –CM Web Portal	Host: DWD, Germany	RA VI	within 3 months after completion of the corresponding month	Website	national maps are provided by NMHSs and linked to the Web Portal by RCC Node-CM

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
Reference climatology	Reference climatologies for monthly mean TT, RR*, pressure**, sunshine duration*, snow cover*, water vapour***, cloud coverage***, radiation components***, soil moisture***	Host: DWD, Germany	RA VI	available	Website (/ftp/on demand)	* land areas only ** model based analysis *** satellite based analysis Water vapour: 2001-2011 Cloud coverage: 1982-2009 Global radiation: 1983-2005 Albedo: 1982-2009 Soil moisture: 1979-2010 Others: 1961-1990 and 1981-2010 where possible

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
	ECA&D based climatologies (TT, RR, extremes indices), based on station data	Host: KNMI, Netherlands	RA VI	Once per month and ad hoc on demand (extreme events)	Website	service also available for Northern RA I
Climate Watch	Climate Watch Advisories	Host: DWD, Germany	Concerned areas within WMO RA VI	In case of an event with updates as needed	To climate watch focal points; password protected website	Discussion of advisories with partners of RCC-CM and RCC-LRF before dissemination
	Climate anomalies and extremes indices, weekly climate watch advisories for Southeast Europe	SEEVCCC, host: RHMS, Serbia	Southeast Europe	Once per week (and ad hoc on demand (extreme events)	Website	Operational work done by SEEVCCC supporting the activities of NMHSs in issuing Climate Watches, based on monthly climate diagnostics bulletin, anomaly maps, climate extremes indices and LRF)
Information and guidance on methodologies and products		All producers				All RCC-services to be described by the related producer. Products of DWD are all accompanied by product description sheets.

Function/ Activity /Criteria*	Product/ Service	Producer	Spatial coverage	Time of issuance	Mean of service provision**	Remarks
Special maps	Monthly and seasonal maps of TT, RR	SEEVCCC, host: RHMS, Serbia	Southeast Europe	Second week of the month for previous month and season		Observed values and anomalies
	Monthly NCEP/NOAA/NCAR analysis	SEEVCCC, host: RHMS, Serbia	Northern Hemisphere	First week of the month for previous month		Various upper air and surface parameters, teleconnection indices, blocking
Co-ordination of training	Workshops, eLearning, training lectures, showcases	Co-ordinating institution: DWD, Germany	RA VI	One event per year	Website, workshop	Training lectures connected with RCOFs, co-organised with RCC Node-LRF.

9.3.4 Highly recommended RCC functions related to climate monitoring

9.3.4.1 *Co-ordination functions*

Considering activities/services of the following initiatives:

- ECA&D exchange of data/information (host: Netherlands),
- ECSN (host: Netherlands)
- CCl ET on CCD Indices (link via Netherlands)
- SEEVCCC (host: Serbia)
- EMCC (host: Turkey)
- Copernicus C3S, C3Surf

9.3.4.2 *Training and capacity building*

Consider activities/services of the following initiative:

- SEEVCCC (host: Serbia)
- EMCC (host: Turkey)
- MedCOF/ SEECOF, NEACOF
- Training "Foundation for Climate Services" (annual) organized by Meteo-France (ENM in Toulouse) with WMO support (http://www.wmo.int/gfcs/node/945)

9.3.4.3 *Research and development*

Improvement of data base / methods / reprocessing of present products (all)

Promote studies of regional climate variability and change, predictability and impact in the Region [Netherlands, Norway, and Serbia (SEEVCCC)]

Promote the use of proxy climate data in long-term analyses of climate variability and change (Netherlands, Norway)

Promote research and development on circulation types and its impact on climate (DWD)

Development of monitoring products related to large scale circulation (MF)

- Which integrated climate change monitoring products are required to serve the full range of application sectors in Europe within a global context?

Consider, in general, activities/services of the following initiative:

- SEEVCCC (host: Serbia)

9.3.4.4 *Additional products and services*

- Extreme event monitoring
    - Percentile maps
    - Event maps
    - Event calendar
    - Maps and diagrams of heat and cold waves
    - Climate Knowledge Data Base on Extreme Events
- Maps of circulation indices and climate diagnostics
    - Blocking frequency and extent
    - circulation types and their climate signals
    - weather regimes and modes of variability, and their impacts on European climate.

9.3.5 Short product/service description

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation etc.
Annual Bulletin on the Climate in RA VI (DWD)	**Methodology:** compilation of national and European contributions of RA VI Members (cf. http://www.dwd.de/rcc-cm) **Spatial resolution:** sub-regional/national/local **Temporal resolution:** year, seasons, months, significant events at all time scales **Quality indicators/Validation:** review by NMHSs
Annual ‚State of the Climate' Report (BAMS/WMO), European Section (DWD/UK MetOffice)	**Methodology:** compilation of national and European contributions of RA VI Members (cf. https://www.ncdc.noaa.gov/bams) **Spatial resolution:** sub-regional/national/local **Temporal resolution:** year, seasons, months, significant events at all time scales **Quality indicators, validation:** peer reviewed
Monthly Climate Diagnostics Bulletin (DWD)	Cf. http://www.dwd.de/rcc-cm **Methodology:** compilation of national and European contributions, assessment of the status of the European climate incl. significant events **Spatial/temporal resolution:** sub-regional/national/local **Quality indicators, validation:** use of quality-checked input information
Contribution to WMO Statement on the Status of the Global Climate (WMO, DWD)	Cf. https://public.wmo.int/en/resources/library **Methodology:** compilation of national and European contributions, assessment of the status of the European climate incl. significant events **Spatial/temporal resolution:** sub-regional/national/local

	Quality indicators, validation: use of quality-checked input information
Monthly maps of TT (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly **Quality indicators/Validation:** use of quality controlled CLIMATs, manual QC of maps
Monthly maps of SST (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly **Quality indicators/Validation:** manual QC of maps
Monthly maps of RR (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.5x0.5° **Temporal resolution:** monthly **Quality indicators/Validation:** data quality control procedure of GPCC
Monthly maps of drought index (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.5x0.5° **Temporal resolution:** monthly **Quality indicators/Validation:** data quality control procedure of GPCC
Monthly maps of sea level pressure (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:**0.1x0.1° **Temporal resolution:** monthly **Quality indicators/Validation:** manual QC of maps
Monthly maps of sunshine duration (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.05x0.05° **Temporal resolution:** monthly **Quality indicators/Validation:** use of quality controlled CLIMATs, manual QC of maps
Monthly maps of cloud coverage (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.25x0.25° **Temporal resolution:** monthly **Quality indicators/Validation:** validation against SYNOP, data quality control procedure of CM-SAF
Monthly maps of solar radiation com-	**Methodology:** cf. http://www.dwd.de/rcc-cm

ponents (DWD)	**Spatial resolution:** 0.05x0.05° for global and direct solar radiation; 0.25x0.25° for surface albedo **Temporal resolution:** monthly **Quality indicators/Validation:** validation against in situ data, data quality control procedure of CM-SAF
Monthly maps of water vapour (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 1x1° **Temporal resolution:** monthly **Quality indicators/Validation:** validation against TEMP (radiosonde measurements), data quality control procedure of CM-SAF
Monthly maps of soil moisture (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.25x0.25° **Temporal resolution:** monthly **Quality indicators/Validation:** data quality control procedure of ESA
Monthly maps of snow cover (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.05x0.05° **Temporal resolution:** monthly **Quality indicators/Validation:** threshold check of SYNOPs, manual check of maps
Daily maps of maximum and minimum temperature (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.05 x 0.05° **Temporal resolution:** daily **Quality indicators/Validation:** threshold check of SYNOPs
Display of national monthly maps of TT, RR, sunshine duration (means/sums and anomalies) from NMHSs in RA VI in the RCC Node –CM Web Portal (DWD)	Cf. http://www.dwd.de/rcc-cm **Methodology:** displaying national and European contributions of RA VI Members **Spatial resolution:** RA VI, sub-Regional., national **Temporal resolution:** annual and monthly maps, significant events on demand **Quality indicators, validation:** (monthly check of availability)
Reference climatology TT (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly, reference period: 1961-90 **Quality indicators/Validation:** use of quality controlled CLIMATs, manual QC of maps

Reference climatology RR (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.5x0.5° **Temporal resolution:** monthly, reference periods: 1951-2000, 1961-1990, 1981-2010 **Quality indicators/Validation:** data quality control procedure of GPCC
Reference climatology sea level pressure (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly, reference period: 1961-90, 1981-2010 **Quality indicators/Validation:** NIL
Reference climatology snow cover (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly, reference period: 1981-2010 **Quality indicators/Validation:** threshold check of SYNOPs, manual check of maps
Reference climatology sunshine duration (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.1x0.1° **Temporal resolution:** monthly **Quality indicators/Validation:** use of quality controlled CLIMATs, manual QC of maps
Reference climatology cloud coverage (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.25x0.25° **Temporal resolution:** monthly **Quality indicators/Validation:** validation against SYNOP, data quality control procedure of CM-SAF
Reference climatology solar radiation components (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.05x0.05° for global and direct solar radiation; 0.25x0.25° for surface albedo **Temporal resolution:** monthly **Quality indicators/Validation:** validation against in situ data, data quality control procedure of CM-SAF
Reference climatology water vapour (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 1x1° **Temporal resolution:** monthly **Quality indicators/Validation:** validation against TEMP (radiosonde measurements), data quality control procedure of CM-SAF

Reference climatology soil moisture (DWD)	**Methodology:** cf. http://www.dwd.de/rcc-cm **Spatial resolution:** 0.25x0.25° **Temporal resolution:** monthly **Quality indicators/Validation:** data quality control procedure of ESA
Monthly maps of humidity, T2m, T1000, T850, SLP, Z500 (ERA I based) (Météo-France)	On line availability on http://seasonal.meteo.fr/en/content/suivi-climatique **Methodology:** computation of monthly means and anomalies of ECMWF analysis against ERA Interim 1981-2010 http://www.meteo.fr/special/CLIM/clim_model.html **Spatial resolution:** global grid, 0.75° **Temporal resolution:** monthly, quarterly **Quality indicators/Validation:** quality procedures of ECMWF
ECA/D based maps, graphs and trends (TT, RR, extremes indices), based on station data and gridded data (KNMI)	**Methodology:** cf. http://eca.knmi.nl **Spatial resolution:** gridded data: 0.25x0.25°and 0.5x0.5° (regular lat./long); station data: > 2300 stations RAVI and RA I-Mediterranean border (station distances ca. 75 km) **Temporal resolution:** monthly and seasonal **Quality indicators/**Validation**:** gridded data: interpolation uncertainty quantified by provision of daily standard errors, station data: Outcomes of 4 peer reviewed absolute homogeneity tests: Standard Normal Homogeneity Test, Buishand Range Test, Pettit Test and the Von Neumann Ratio Test leads to three classes of homogeneity of all series: useful, doubtful and suspect. **References:** - Haylock, M.R., N. Hofstra, A.M.G. Klein Tank, E.J. Klok, P.D. Jones, M. New., A European daily high-resolution gridded dataset of surface temperature and precipitation. J. Geophys. Res (Atmospheres), 113 (2008) - Klok, E.J. and A.M.G. Klein Tank, Updated and extended European dataset of daily climate observations, Short Communication, Int. J. Climatol. (2008) - WMO Guide (no. 8) to Meteorological Instruments and Methods of Observation - WMO Guide (no. 100) to Climatological Practices
ECA/D based climatologies (TT, RR, extremes indices), based on station data (KNMI)	**Methodology:** cf. http://eca.knmi.nl **Spatial resolution:**> 2300 stations RAVI and RA I-Mediterranean border (station distances ca. 75 km) **Temporal resolution:** 1961-1990 normal period **Quality indicators/Validation:** Outcomes of4 peer reviewed absolute homogeneity tests: Standard Normal Homogeneity Test, Buishand Range Test, Pettit Test and the Von Neumann Ratio Test leads to three classes of homogeneity of all series: useful, doubtful and suspect.

	References: - Klok, E.J. and A.M.G. Klein Tank, Updated and extended European dataset of daily climate observations, Short Communication, Int. J. Climatol. (2008) - WMO Guide (no. 8) to Meteorological Instruments and Methods of Observation - WMO Guide (no. 100) to Climatological Practices
Monthly and seasonal maps of TT, RR and anomalies for the Southeastern Europe	**Methodology:** cf. http://www.seevccc.rs **Spatial resolution:**0.5x0.5° **Temporal resolution:** monthly, seasonal **Quality indicators/Validation:** use of quality controlled CLIMATs and SYNOPs, manual QC of maps
Monthly NCEP/NOAA/NCAR analysis; Various upper air and surface parameters, teleconnection indices, blocking	**Methodology:** cf. http://www.seevccc.rs **Spatial resolution:** 2.5x2.5° **Temporal resolution:** monthly
Monthly maps of TT, Monthly anomaly of TT, RR for the Eastern Mediterranean (TSMS)	ECMWF ERA 40 and other sources **Methodology:** cf. http://emcc.mgm.gov.tr **Spatial resolution:** 0.125x0.125° **Temporal resolution:** monthly, seasonal, reference period 1981-2010 **Quality indicators/Validation:** ECMWF and WMO guidelines
Monthly anomaly maps of TT, RR for the South Caucasus region (Armstatehydromet)	**Methodology:** cf. http://ingrid.ldeo.columbia.edu/ and http://www.cdc.noaa.gov/data/gridded/data.ncep.reanalysis.html **Spatial resolution:** TT: 260x260 km; RR: 2°x2° **Temporal resolution:** monthly, seasonal, reference period 1948-2009 **Quality indicators/Validation:** see URLs above
Climate Watch (DWD, RHMS/ SEEVCCC)	**Methodology:** Preparation of supporting material, co-ordination and advice to the NMHSs for their issuing climate watches in accordance with the WMO Guidelines on Climate Watches and agreed procedures by the participating NMHSs (DWD for whole RA VI, RHMS for the southeast European region) **Reference:** Guidelines on Climate Watches, WMO/TD No. 1269, 2005, WMO
Large scale indicators : weather regimes and modes of variability	**Methodology :** Principal Component Analysis from Z500 for the modes, classification of daily Z500 or SLP fields for the regimes **Spatial resolution :** Indices defined according to the Europe/Atlantic domain **Temporal resolution :** Daily for weather regimes (2 seasons, 4 regimes), monthly

	for modes of variability (NAO, East Atlantic, Scandinavian Blocking) **Quality indicators / validation :** Documentation available on the LRF Website : http://seasonal.meteo.fr/en/content/doc-generale
Monthly and seasonal maps of TT, RR and anomalies for the Southeastern Europe	**Methodology:** cf. http:// www.seevccc.rs **Spatial resolution:** 0.5x0.5° **Temporal resolution:** monthly, seasonal **Quality indicators/Validation:** use of quality controlled CLIMATs and SYNOPs, manual QC of maps
Monthly NCEP/NOAA/NCAR analysis; Various upper air and surface parameters, telecon-nection indices, blocking	**Methodology:** cf. http:// www.seevccc.rs **Spatial resolution:** 2.5x2.5° **Temporal resolution:** monthly

9.4 The RA VI RCC Toulouse and Moscow Node on Long-range Forecasting: Services and providers (RCC Node-LRF)

9.4.1 RCC Node-LRF Leading Institution

Leading institution	Focal Point
Météo-France 1, quai Branly 75340 Paris Cedex 07 France.	Mr Jean-Michel SOUBEYROUX Météo-France 42, av. G. Coriolis 31057 TOULOUSE cedex 1 France Phone: +33 5 61 07 83 69 Fax: +33 5 61 07 83 09 eMail: jean-michel.soubeyroux@meteo.fr
Roshydromet Novovagankovsky Per., 12 Moscow, Russia, 123995	Mrs Valentina KHAN Hydrometcentre of Russia, 11-13, Bolshoi Predtechenskyst., MOSCOW, Russia, 123242 Phone: +7 (499) 795-21-96 Fax: +7 (499) 255-15-82 eMail: khan@mecom.ru

9.4.2 RCC Node-LRF Consortium Members

Consortium members	Focal Point
Norwegian Meteorological Institute P.O. Box 43 Blindern 0313 Oslo Norway	Mr. Hans Olav HYGEN Climatology Department P.O. Box 43 Blindern 0313 OSLO Norway Phone: +47 22 96 3208 Fax: +47 22 96 30 50 eMail: hans.olav.hygen@met.no
Republic Hydrometeorological Service of Serbia (RHMSS) Kneza Viseslava 66 11030 Belgrade Serbia	Mr Goran PEJANOVIC Republic Hydrometeorological Service of Serbia Kneza Viseslava 66 11030 BELGRADE Serbia Phone: +381 11 2066900 Fax: +38111 35 37 847 eMail: goran.pejanovic@hidmet.gov.rs; office@hidmet.gov.rs

Turkish State Meteorological Service P.O. Box 401 Ankara Turkey	Mr Serhat SENSOY Ms Basak YAZICI Engineer in Climatology Division Turkish State Meteorological Service Department of Research P.O. Box 401 ANKARA Turkey Phone: +90 312 20327 44 eMail: ssensoy@mgm.gov.tr and serhatsensoy@gmail.com byazici@mgm.gov.tr

9.4.3 RCC Node-LRF Service Provision Overview and evolutions

Operational activities for LRF

Function/ Activity /Criteria	Product/ Service	Producer	Areal coverage	Time of issuance	Mean of service provision	Remarks
Operational interpretation of GPCs products and assessment of GPCs forecast performance (Temperature and Precipitation)	Global Graphs and maps of model performances	Roshydromet, Russian Federation	RA VI	Update when model is upgraded	Website*	In accordance with requirements of GDPFS/SVS for LRF
		Météo-France, France	Global, RA VI	Each MF Model updating	Website#	Only for MF model, following GDPFS/SVS specifications for LRF
	Monthly or quarterly bulletins analysing and interpreting GPC products	Météo-France, France	RA VI	End of month for next 3 months	Website#	Report containing text, maps, graphics on GPC and MM forecasts (LCMME, EuroSIP or C3S)
		Roshydromet, Russian Federation	RA VI	End of month**	Website	Bulletins containing textual and graphical information
		SEEVCCC, host: RHMS, Serbia	Southeast Europe	Every week for next 4 weeks, up to 3 months	Website	Bulletins containing text, graphics and maps
		TSMS, Turkey	Eastern Mediterranean	End of month for next 3 months	Website	Currently available, at http://emcc.mgm.gov.tr

Tailored products/probabilities	Boxes, Maps, Oceanic Plums, Climagrams, Weather regimes, variability modes, impact parameters, seasonal outlook	Météo-France, France	RA VI[##]	Beginning of each month; Except for seasonal outlook: end of each month	Website[#]	[##]Boxes covering Western Europe and MedCOF area; weather regimes and variability modes relevant for Western Europe. Impact parameters (PET, extreme event probabilities) on going
	Seasonal outlook Climate indices forecasts Subseasonal forecasts Climate watch advisories	Roshydromet, Russian Federation	RA VI	End of month** End of month** Every week for six weeks ahead In accordance to situation	Website Website Website Website	Probably combined with forecast consistency statement Table and digital forms Accompanied with skill scores Experimental
	Seasonal outlook	Met Norway, Norway	Northwest Europe	Mid of each month	Website	
	Monthly forecast products	Météo-France from ECMWF model	RA VI	TBC : beginning of each month	Website	New products proposed in 2018

Consensus statements	Global bulletin and consensus meeting	Météo-France, France	RA VI	End of month for next 3 months;	Website	Monthly consensus meeting with Mercator Ocean and CNRM-Meteo France (Research on SF modelling)
	Forecast consistency statement Consensus statement developed during NEACOF sessions	Roshydromet, Russian Federation	RA VI and RA II	End of month** Twice per year (end of spring and end of autumn)	Website	Probably combined with seasonal outlook Available since 2011
Verification	Verification datasets and bulletins	Météo-France, France	RA VI	verification datasets available with model updating Twice a year verification bulletin (winter and summer forecast)	ftp, website	Verification bulletin available since 2017
		Roshydromet, Russian Federation	RA VI	available	Website/ftp	
WebPortal	Website	Météo-France, France	RA VI	available	LRF Website	For WMO Members, password protected for seasonal forecast products

	Website	Roshydromet, Russian Federation	RA VI	available		For WMO Members
	Website	SEEVCCC, host: RHMS, Serbia	Southeast Europe	available	Website	Freely available, some products restricted
User feedback	Annual report during Intergovernmental Council on Meteorology of CIS Questionnaire during NEACOF sessions	Roshydromet, Russian Federation	RA VI and RA II	Autumn		Input via Website, workshops
		Météo-France, France				RCOF considered and RCC feedback mechanisms
Information and guidance on methodologies and products	Website	All producers	Global and RA VI	Model updating or new products implementation	Technical report and product sheets on Website	See 9.4.4 http://seasonal.meteo.fr/en/content/doc-generale
Co-ordination of training	Training Courses	Co-ordinators:				Meteo-France : Annual

	– pre NEACOF	Météo-France and Roshydromet				Seasonal Forecast training in Toulouse and contribution to RCOF trainings (MedCOF, …) Roshydromet: workshops, training courses with emphasis on Eastern Europe

Footnotes:

[#] - http://www.bom.gov.au/wmo/lrfvsseasonal.meteo.fr

* - http://neacc.meteoinfo.ru

** - time of issuance might be changed on notice

9.4.4 Highly recommended RCC functions related to long-range forecasting

9.4.4.1 *Climate prediction and climate projection*

- Assisting RCC users in access to and interpretation of climate model projections (e.g. via NEACC website)

9.4.4.2 *Coordination functions*

- Assisting NMHSs in user liaison via organization of multidisciplinary workshops and meetings on user needs (RCC Node-LRF/Co-lead-Moscow, …);
- Strengthening collaboration and networking in the climate related activities between NMHSs in Europe and beyond (in CIS, North Africa);

9.4.4.3 *Training and capacity building*

- MedCOF/ SEECOF, NEACOF training sessions
- Trainings of NMHSs' forecasters in NEACC and the Regional training center Moscow (host: Russia)
- EE/VCCC training in data management, climate modelling and interpretation of model outputs (host: Serbia)

9.4.4.4 *Research and development*

- Participation in the S2S, PPP initiatives
- Development and improvement of the regionally oriented long-range forecasting products (downscaling etc.)
- Development of user specific forecast products for NEACC users (forestry, health etc.)

9.4.4.5 *Additional products and services*

- Forecasting of extreme events (NEACC foreseen products)
    - Forecasts of extreme indices (maps and digital data)
    - Percentile data (maps and digital data)
    - Binary forecast and reforecast fields for development of applications

9.4.5 RCC Node-LRF Short Product/ Service Description

(Methodology, spatial/temporal resolution, quality indicators, validation)

9.4.5.1 *Météo France*

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation etc.
Valid graphs and maps of model performances	**Methodology :** evaluation of model performances following WMO SVS specifications and using a hindcast experience of at least 15 years (see model configuration at www.bom.gov.au/wmo/lrfvs) **Spatial resolution : model resolution or** 2.5°x2.5° and sub-domains (see SVS)

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation etc.
	Temporal resolution : 12 overlapping seasons + months **Quality indicators/Validation :** SVS scores
Monthly bulletins analysing and interpreting GPC products	**Methodology :** compilation and expertise of global dynamical forecasts **Spatial/temporal resolution :** Global and Western Europe, 3 month **Quality indicators, validation :** availability in time
Maps, Oceanic Plums, Climagrams, Large scale information (Weather regimes and Variability modes), Impact parameters, seasonal outlook	**Methodology:** Post-processing of seasonal forecasts of relevant parameters (boxes, maps, oceanic plums and climagrams) and geopotential High at 500hPa (weather regimes) and modes of variability).Interpretation of seasonal forecasts (seasonal outlook over RA VI). **Spatial/temporal resolution :** Global, sub-regional, 3 month, 1 month **Quality indicators, validation:** SVS Scores available on LRF website. See for boxes example : http://seasonal.meteo.fr/en/content/ARP5-scores
Monthly forecast products	To be considered in 2018
Global bulletin and Teleconference, consensus meeting	**Methodology:** compilation and expertise of global dynamical forecasts (Global Bulletin), Expert discussion on the interpretation of seasonal forecasts (Global Bulletin based and using Web facilities). **Spatial resolution :** : Global and sub-regional **Temporal resolution :** month (state of the climate system), 3 month (forecasts) **Quality indicators/Validation :** availability in time
Verification datasets and bulletin	**Methodology:** - Verification datasets provided and updated under the responsibility of the LC-LRFSVS Available on request or at www.bom.gov.au/wmo/lrf (to be updated); - Verification bulletin defined with the C3S program
ftp/Website	**Methodology :** ftp site password protected at ftp://ftp.meteo.fr/dclimdev_ple/wmo_ple **Temporal resolution :** monthly updated **Quality indicators/Validation :** link availability
Information and guidance on methodologies and products	**Methodology:** Online documents available on model description and products http://seasonal.meteo.fr/en/content/documentation **Quality indicators/Validation :** Link availability and requests addressed to rcc-lrf@meteo.fr

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation etc.
Co-ordination of training	**Methodology:** update and dissemination of available training relevant for LRF. **Quality indicators/Validation :** dissemination of relevant information

9.4.5.2 *Roshydromet*

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation etc.
Monthly bulletins (Seasonal outlooks) analysing and interpreting GPC products (include textual and graphical information)	**Methodology :** compilation and expertise of global dynamical forecasts **Spatial Coverage:** RA-VI and North Eurasia 2°x2° **Temporal resolution:** Rolling season (3 months) with monthly update **Quality indicators/Validation :** Availability in time; Regional SVS scores on the basis of at least 15 years of retrospective forecasts **Information and guidance on methodologies and products:**description of forecasting technology and guidance to be presented on website
Forecast maps for probabilistic and deterministic seasonal forecasts of basic meteorological parameters - single model and multi-model (2 Roshydromet global models) composite maps	**Methodology :** statistical interpretation of global dynamical seasonal forecasts **Spatial resolution and coverage:** 2.5°x2.5°; RA-VI, North Eurasia, Arctic and Globe **Temporal resolution:** Rolling season (3 months) with monthly update **Quality indicators, validation :** Availability in time; Regional SVS scores on the basis of at least 15 years of retrospective forecasts **Information and guidance on methodologies and products:** description of forecasting technology and guidance to be presented on website
Seasonal forecasts of climate indices presenting large-scale modes of atmospheric variability (EA, WA,EU, WP, PNA, NAO, POL, AOS) in the table form	**Methodology:** Tailored products on the basis of global dynamical seasonal forecasts **Spatial resolution :** Spatially aggregated information **Temporal resolution:** Monthly resolution and aggregation over rolling 3 months' periods with monthly update **Quality indicators, validation :** Availability in time; Regional SVS scores on the basis of at least 15 years of retrospective forecasts **Information and guidance on methodologies and products:**description of forecasting technology and guidance to be presented on website
Sub-seasonal forecasts of basic meteorological parameters in the form of maps - single model and multi-model (2 Roshydromet global models) composite maps	**Methodology :** statistical interpretation of global dynamical seasonal forecasts **Spatial resolution and coverage:** 2.5°x2.5°; RA-VI, North Eurasia, Arctic **Temporal resolution:** Weekly update and weekly aggregation for the period up to 6 weeks **Quality indicators, validation :** Availability in time; Regional SVS scores on the basis of at least 15 years of retrospective forecasts

	Information and guidance on methodologies and products: description of forecasting technology and guidance to be presented on the website
Climate watch advisories	Methodology: Consensus-based approach Status: experimental

9.4.5.3 *Norwegian Meteorological Institute*

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation
Outlook regarding the air temperature for the next three months for North-West Europe given as deviation from the normal. Map published in the middle of the month.	**Methodology:** Based on the seasonal forecasts from ECMWF. **Spatial resolution:** 1.1ºx1.1º and less **Temporal resolution:** Mean for the next three months **Validation:** Time series of the ensemble values, ensemble means and observed values since 2002 are presented in 9 points.

9.4.5.4 *SEEVCCC (host: Serbia):*

Product/Service	Methodology, spatial/temporal resolution, quality indicators, validation
South East European seasonal forecast bulletins containing: - Textual bulletin for Tmean, RR for next 3 months; - Graphics for selected points in SEE for Tmean, Tmin, Tmax, RR for next 6 months; - Maps for Tmean, RR for SEE region and SST for the Mediterranean Sea for next 6 months.	**Methodology :** Ensemble of seasonal forecast. Dynamical downscaling of ECMWF 51 members for seven months. **Spatial resolution :**0.25°x0.25°lat/lon grid [numerical outputs are available in GRIB format every month for seven months ahead and consist of direct output data from the model as well as of derived fields calculated in post-processing]. **Temporal resolution :** seasonal forecasts with monthly resolution; **Quality indicators/Validation:** Scores and diagrams will be produced and exchanged for probabilistic forecasts in accordance with the WMOManual on the GDPFS/SVS for LRF. **Information and guidance on methodologies and products:** SEEVCCC-products, methodology and guidelines to be described in English

South East European monthly forecast bulletins containing: - Textual bulletin for Tmean, RR for next four weeks; - Maps for Tmean, Tmax, Tmin and RR for SEE region for next four weeks	**Methodology :** statistical processing of numerical outputs of the ECMWF Monthly forecast; **Spatial resolution :** 0.5°x0.5° lat/lon grid; **Temporal resolution :** monthly forecasts with weekly resolution; **Quality indicators/Validation:** ensemble values, ensemble means and observed values since 2012; **Information and guidance on methodologies and products:** description of forecasting technology and guidance to be presented on web-site

9.4.6 RCC Node-LRF Short Description of (expected) Interfaces to other RCC Nodes

9.4.6.1 *Météo-France:*

Coordination between Climate monitoring and LRF nodes through the RA VI RCC Nodes.

Contribution to the Polar RCC-LRF implementation with the Canadian NMS

9.4.6.2 *Roshydromet:*

Interface: primarily Internet-based and English language.

Current and retrospective forecasts in digital form to be made available to other RCC nodes for development of applications, climate watch and other potential needs.

Coordination and cooperation with other RA VI RCC LRF Nodes and RCCs for developing of consensus statements during NEACOF sessions

9.4.6.3 *Norwegian Meteorological Institute:*

Interface: Primary Internet-based and English language.

9.4.6.4 *SEEVCCC (host: Serbia):*

South East European seasonal forecast products are available for climate watch within the RCC node on Climate Monitoring and other development of applications.

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