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**5. EUMETNET COMPOSITE OBSERVING SYSTEM EUCOS**

(Submitted by Jochen Dibbern, Co-chair OPAG-IOS and Stefan Klink, EUMETNET Obs Programme Manager)

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| **Summary and purpose of document**The document provides EUMETNET contribution to the development of the RBON concept. |

**ACTION PROPOSED**

The session will be invited to take into account the information provided by the document for finalizing the draft Concept.

**EUMETNET COMPOSITE OBSERVING SYSTEM EUCOS**

The past RBSN and RBCN in RA-VI were based on a design representing the late 1990s status of the observing networks. Due to the fact, that the majority of stations in the RBSN and RBCN were multipurpose, serving both synoptic and climatological purposes, at a Regional Association Session 16 in 2013 it was decided, as a first step to combine RBSN and RBCN stations in a revised network configuration. In addition, the Region VI Working Group on Technology Development and Implementation (RA VI-WG-TDI), through its Task Team on the Re-design of the Regional Basic Observing Network (TT-RRBON) was tasked to develop a re-designed RBON which would also take into consideration the inclusion of new ground based observing systems, such as weather radars, wind profiler systems, existing buoys, ships and aircraft that make meteorological, climatological and marine observations. The network re-design would also be coordinated with satellite observations.

As specified in the RA VI Strategic Plan, the available regional assets, such as the European Meteorological Infrastructure (EMI) should be used and expanded over the whole Region. Thus, the EIG EUMETNET Observations Programme’s network had been considered as a model and as a core part of the RA VI RBON and the EUMETNET European Climate Support Network (ECSN) activities should form the basis of the regional climate network.

The EIG EUMETNET Observations Programme’s main objective is a central management of surface based operational observations on a European-wide scale serving the needs of general forecasting, specifically those of numerical weather prediction, and those of climate monitoring. The coordination of NMHS owned territorial networks (e.g. radiosonde stations and synoptic stations), data quality monitoring, fault reporting and recovery, a studies programme for the evolution of the observing networks and liaison with other organizations like WMO are among the tasks of the programme.

Changing user requirements concerning observational data and external drivers like new developments in measurement technology and observing systems but also increasing pressure on NMHS’ budgets demand for a periodic redesign of the existing observing networks. Changes in networks should be based on scientific analyses and therefore the EUMETNET Observations Programme launched several studies in the past. Such studies usually comprise of a set of observing system experiments (OSE) or similar experiments which are run to assess the impact of different observing systems on NWP forecast skill. NWP groups of NMHSs or ECMWF conduct the studies and the Observations Programme works as an interface between data users and providers.

As an example the study type and purpose, the way it was conducted and the results and derived recommendations are described below. Although the specific network re-design recommendations are not applicable in other WMO regions, the example nevertheless demonstrates the approach taken in RA-VI.

### Upper-air network redesign study

**Study type:** OSE

**Purpose:** The aim was to define a European-wide composite network of ground-based upper-air observing systems comprising of NMHS owned radiosondes and AMDAR data providing airports. Thereby the configuration and setting of the network should be based on scientific analyses rather than on a simple merging of historically grown national networks.

**Description:** With the aim of defining a new EUCOS upper-air network design, OSEs were run with different scenarios in order to get a guideline for an optimum setting of upper-air measurements in space and time which maintains forecast skill. The OSEs were run by ECMWF, the HIRLAM group and OMSZ.

**Results and recommendations:**

All participants of the EUCOS upper-air network redesign study provided final reports on their findings and conclusions. The former EUMETNET Programme Board for Observations (PB-OBS) agreed to the recommended scenario consisting of 93 radiosonde stations in the area of EUMETNET members. The Scenario is defined as follows:

* horizontal spacing of 100 km for profiles at 06, 12 and 18 UTC, thereby replacing radiosonde sites with AMDAR data if 3-hourly AMDAR measurements are available at those locations,
* but keeping all radiosonde launches at 00 UTC.

However, as long as aircraft do not provide operational humidity measurements over Europe it is recommended to provide radiosoundings twice per day even if AMDAR measurements are available at airports in the vicinity of the radiosonde site.

There were other studies with recommendations on AMDAR Humidity and profile measure-ments, on ASAP and use of drifting buoys.

In the framework of the EUMETNET Observations Programme Observing System Network Design recommendations have to be derived during the next few years concerning the following observing networks and technologies:

* In-situ upper-air profiles: composite observing system comprising of radiosondes, AMDAR data, potentially other aircraft based observations, Mode-S/ ADS-B data, total column water vapour from GNSS satellite-to-ground total zenith delay, wind profiler;
* In-situ surface marine observations: composite observing system comprising of conventional and automated voluntary observing ships, drifting and moored buoys;
* Weather radar derived observations: besides reflectivity and Doppler-velocity measurements, is there a need for dual-polarization data?

EUMETNET Assembly as well as RA-VI Management Group agreed that the results of the EUMETNET studies should be taken as the basis for the RA-VI RBON design. Due to the lack of resources, little progress has been achieved so far.

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