

Geneva, Switzerland, 9-12 July, 2013

## ACTIVITIES AND OUTCOMES OF OTHER WMO TEAMS AND PROGRAMMES RELEVANT TO ET-SBO

Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE)

*(Submitted by the Secretariat)*

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### SUMMARY AND PURPOSE OF DOCUMENT

This document provides information the activities of the Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE), providing some details on how these relate to the work of the ET-SBO.

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### ACTION PROPOSED

The Meeting is invited to note the information contained in this document when discussing relevant agenda items. See in particular the section entitled "*Things for the ET-SBO to consider*".

- Appendix I** Terms of Reference of the IPET-OSDE  
**Appendix II** Membership of the IPET-OSDE  
**Appendix III** Workplan of the IPET-OSDE for the period 2012-2016  
**Appendix IV** EGOS-IP actions relevant to the work of the ET-SBO  
**Appendix V** Computation of generic capabilities on the basis of surface-based observing systems metadata

### References:

1. Background information on the Rolling Review of Requirements (RRR)  
[www.wmo.int/egos](http://www.wmo.int/egos)
  2. WIGOS Operational Information Resource (WIR) pages on OSDE  
<http://www.wmo.int/pages/prog/www/wigos/wir/osde.html>
  3. Vision of the Global Observing System (GOS) in 2025  
<http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>
  4. Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)  
<http://www.wmo.int/pages/prog/www/OSY/Publications/EGOS-IP-2025/EGOS-IP-2025-en.pdf>
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## **INTER PROGRAMME EXPERT TEAM ON OBSERVING SYSTEM DESIGN AND EVOLUTION (IPET-OSDE)**

1. Design, planning and optimized evolution of WIGOS component observing systems is one of the key activities of the WIGOS Framework Implementation Plan (WIP). The corresponding activities are coordinated through the CBS OPAG-IOS Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE), which Terms of Reference adopted by CBS-15 (Jakarta, 10-15 September 2012) are provided in Appendix I.
2. The IPET-OSDE is the successor of the former Expert Team on the Evolution of Global Observing Systems (ET-EGOS), which *inter alia* guided the development of the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP<sup>1</sup>) per the WMO Rolling Review of Requirements (RRR).
3. The EGOS-IP, which is responding to the Vision of the GOS in 2025<sup>2</sup> was adopted by CBS-15 through Recommendation 6, and came into force with the adoption by EC-65 (May 2013) of Resolution 4.4/2 (CBS-15 report).
4. While the WIGOS Framework Implementation Plan (WIP) addresses the overarching framework for the integration of the observing systems, the EGOS-IP addresses their evolution. The EGOS-IP is a key document providing Members with clear and focused guidelines and recommended actions in order to stimulate cost-effective evolution of the observing systems to address in an integrated way the requirements of WMO programmes and co-sponsored programmes. The EGOS-IP had been prepared in response to the "Vision for the GOS in 2025<sup>2</sup>" and new needs of WIGOS, GFCS and other WMO priorities, through valuable contributions from various expert teams and other collaborators. The EGOS-IP includes a total of 115 actions, including 13 over-arching and cross-cutting actions, 59 surface-based observing systems' related actions, 35 space-based observing systems' related actions, and 8 space weather related actions.
5. CBS-15 requested OPAG-IOS to monitor progress made by Members and other implementing agents on the many actions contained in the new EGOS-IP, and to find ways of improving the engagement of Members and Regions with EGOS-IP actions. It encouraged Members, together with the Secretariat, to mobilize additional resources to drive these activities forward. Designated National Focal Points (NFPs) of many Members are reporting on progress and plans in their countries related to actions in the original EGOS-IP. However, since not all Members have nominated NFPs for this activity, Members should be requested to do so.
6. The IPET-OSDE workplan for the period 2012-2016 was reviewed and approved by the CBS Management Group at its fourteenth Session (Geneva, 17-19 January 2013). Besides the routine activities related to the undertaking of the rolling Review of Requirements for the 12 WMO Applications Areas<sup>3</sup>, including monitoring progress and actions with regard to the EGOS-IP, the workplan includes promotion of CBS activities in support of GFCS and GCW goals, as well as contribution to the implementation of WIGOS, including WIGOS Manual, and provision of relevant advice and support to the chairperson of ICT-IOS. The workplan is also to propose guidance regarding observing system network design principles.
7. The Sixty-fifth Session of the Executive Council (EC-65, Geneva, Switzerland, 15-23 May 2013) recalling Recommendation 6 (CBS-15) - EGOS-IP, urged Members, in collaboration with partner organizations and identified agents in the EGOS-IP, to address the 115 actions listed in the Plan. The Council recognized the need to monitor the implementation of the EGOS-IP actions, and requested Members, who have not yet done so, to nominate National Focal Points

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1 <http://www.wmo.int/pages/prog/www/OSY/Publications/EGOS-IP-2025/EGOS-IP-2025-en.pdf>

2 <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>

3 (1) Global Numerical Weather Prediction, (2) High Resolution Numerical Weather Prediction, (3) Nowcasting and Very Short Range Forecasting, (4) Seasonal and Inter-annual Forecasts, (5) Aeronautical Meteorology, (6) Atmospheric Chemistry, (7) Ocean Applications, (8) Agricultural Meteorology, (9) Hydrology, (10) Climate Monitoring (GCOS), (11) Climate Applications, and (12) Space Weather.

tasked to monitor the implementation of the EGOS-IP nationally, report on implementation issues, and provide feedback to the CBS Inter-Programme Expert Team the Observing Systems Design and Evolution through the Secretariat.

8. An *ad hoc* reduced IPET-OSDE meeting focusing on guidance regarding observing system network design principles is planned in Geneva, Switzerland, from 12 to 14 November 2013.

9. A regular IPET-OSDE meeting to address all of the IPET-OSDE Terms of Reference is planned in Geneva in 2014.

### **Things for the ET-SBO to consider**

10. Appendix I provides the Terms of Reference of the IPET-OSDE. Appendix III also provides the workplan of the IPET-OSDE for the period 2012-2016.

11. The following IPET-OSDE Terms of Reference are particularly relevant to the work of the ET-SBO. The ET-SBO is invited to bring its perspective on the points listed below through the ET-SBO chair, who is represented in the IPET-OSDE as core member.

- (b) Review and report on the capability of both surface-based and space-based systems that are components or candidate components of the evolving observing systems within the scope of WIGOS;
  - ⇒ The IPET-OSDE is planning to make surface-based observing system capabilities available via the surface component (OSCAR/Surface) of the Observing Systems Capabilities Analysis and Review Tool (OSCAR) starting from an evolution of WMO No. 9, Volume A.
  - ⇒ To that extent, and in the framework of WIGOS Implementation, it is planned that Members shall be responsible for maintaining the information about the observing stations they operate in the OSCAR database. They will be required to nominate national focal points responsible for that. In some cases focal points will be regional (e.g. EUMETNET) or programmatic (e.g. JCOMM, GAW) and mechanisms will be put in place to avoid duplication of efforts.
  - ⇒ The question of the radar database, and how it will be interoperable with OSCAR/Surface will have to be discussed.
  - ⇒ To date, only the technical specification of OSCAR/Surface have been written. Appendix V is an excerpt from these technical specifications describing how generic capabilities are computed on the basis of surface-based observing systems descriptions. An important question from an ET-SBO perspective will be the question of how surface radar capabilities are represented and derived from the metadata so that they can be compared with observational user requirements for an objective critical review. Appendix V provides some proposed solution to this question.
- (f) Monitor and report progress against the new version of the Implementation Plan for Evolution of Global Observing Systems, based on the "Vision for the GOS in 2025"; identify new actions as necessary, taking into account developments within WIGOS, including those of the observations and monitoring pillar of the GFCS;
  - ⇒ Appendix IV is listing the EGOS-IP actions that are relevant to the work of the ET-SBO. ET-SBO is invited to provide feedback on how they are being addressed by Members.
- (i) Propose guidance regarding observing system network design principles;
  - ⇒ IPET-OSDE will explore different aspects of observing system design in which WMO may wish to propose guidance (examples below). ET-SBO is invited to provide its perspective on this regard.
    - Design principles for single technology observing systems (e.g. surface radars);

- Design principles for composite observing systems;
  - Capacity Development issues;
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## APPENDIX I

### TERMS OF REFERENCE OF THE INTER-PROGRAMME EXPERT TEAM ON THE OBSERVING SYSTEM DESIGN AND EVOLUTION (IPET-OSDE)

*(as approved by CBS-15)*

- (a) Review and report on the observational data requirements of application areas<sup>1</sup> within the scope of WIGOS;
- (b) Review and report on the capability of both surface-based and space-based systems that are components or candidate components of the evolving observing systems within the scope of WIGOS;
- (c) Carry out the rolling requirements review of application areas leading to Statements of Guidance concerning the extent to which present and planned observing systems meet user requirements for observations;
- (d) Review the implications of the Statements of Guidance concerning the strengths and deficiencies in the existing observing systems and evaluate the capabilities of new observing systems and possibilities for improvements and efficiencies;
- (e) Carry out impact studies of real and hypothetical changes to observing systems with the assistance of NWP centres;
- (f) Monitor and report progress against the new version of the Implementation Plan for Evolution of Global Observing Systems, based on the “Vision for the GOS in 2025”; identify new actions as necessary, taking into account developments within WIGOS, including those of the observations and monitoring pillar of the GFCS;
- (g) Promote activities which enhance progress against the Implementation Plan for Evolution of Global Observing Systems;
- (h) Propose updates to the “Vision for the GOS in 2025”, in response to evolving user requirements and observing system capabilities;
- (i) Propose guidance regarding observing system network design principles;
- (j) Prepare documents to assist Members, Technical Commissions, and Regional Associations, summarizing the results from the above activities;
- (k) Provide advice and support to the Chairperson of OPAG-IOS on development and implementation of WIGOS.

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<sup>1</sup> WMO Application Areas include Global Numerical Weather Prediction (NWP), High Resolution NWP, Nowcasting and Very Short-Range Forecasting (NVSFRF), Seasonal to Inter-Annual Climate Prediction (SIAF), Aeronautical Meteorology, Atmospheric Chemistry, Ocean Applications, Agricultural Meteorology, Hydrology and Water Resources, Climate monitoring (GCOS), Climate applications (other aspects, CCI), Space Weather, and GTOS (non GCOS requirements of GTOS)

## APPENDIX II

**MEMBERSHIP OF THE CBS OPAG-IOS  
INTER-PROGRAMME EXPERT TEAM ON THE OBSERVING SYSTEM DESIGN AND  
EVOLUTION (IPET-OSDE)**

<b>MEMBER NAME</b>	<b>COUNTRY / AGENCY</b>	<b>R / A</b>	<b>POSITION / REPRESENTING</b>
JOHN EYRE (CHAIR)	UNITED KINGDOM	6	CORE
JAY LAWRIKORE (VICE-CHAIR)	UNITED STATES	4	CORE / REPRESENTING (TBD: ALSO GCOS)
ERIK ANDERSSON	ECMWF	6	CORE / R-SEIS
STUART GOLDSTRAW	UNITED KINGDOM	6	CORE / CHAIR, ET-SBO
BAI LI	CHINA	2	CORE
DR GUIMEI LIU	CHINA	2	CORE / JCOMM
VARANISESE VUNIYAYAWA	FIJI	5	CORE / CCL
YOSHIKI SATO	JAPAN	2	CORE / R-SEIS
LARS PETER RIISHOJGAARD	UNITED STATES	4	ASSOCIATE / CHAIR, ICT-IOS
JOCHEN DIBBERN	GERMANY	6	ASSOCIATE / CO-CHAIR, ICT-IOS
RUSSELL STRINGER	AUSTRALIA	5	ASSOCIATE / VICE-CHAIR, IPET-WIFI
FRANK GROOTERS	NETHERLANDS	6	ASSOCIATE / CHAIR, ET-ABO
ANTHONY REA	AUSTRALIA	5	ASSOCIATE / CHAIR, ET-SUP
SID-AHMED BOUKABARA	UNITED STATES	4	ASSOCIATE / ET-SAT
PAOLO AMBROSETTI	SWITZERLAND	6	ASSOCIATE / DPFS
WOLFGANG FRICKE	GERMANY	6	ASSOCIATE / CAS
JITZE VAN DER MEULEN	NETHERLANDS	6	ASSOCIATE / CAEM
ALI MAFIMBO	KENYA	1	ASSOCIATE / JCOMM

<b>MEMBER NAME</b>	<b>COUNTRY / AGENCY</b>	<b>R A</b>	<b>POSITION / REPRESENTING</b>
ROSEMARY MUNRO	EUMETSAT	6	ASSOCIATE / EUMETSAT
JEAN-BLAISE NGAMINI	ASECNA	1	ASSOCIATE / ASECNA
STEFAN KLINK	EUCOS	6	ASSOCIATE / EUCOS
JAN RENÉ LARSEN		6	ASSOCIATE / SAON
JEFF KEY		4	ASSOCIATE / GCW
THOMAS SZYNBORSKI	UNITED STATES	4	ASSOCIATE
TBD		3	ASSOCIATE / REPRESENTING RA III
TBD			ASSOCIATE / CIMO
TBD			ASSOCIATE / CHY
TBD			ASSOCIATE / CAGM
TBD			ASSOCIATE / GCOS
TBD			ASSOCIATE / HMEI

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## APPENDIX III

## WORK PLAN FOR THE IPET-OSDE FOR THE PERIOD 2012-2016

No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
1	To contribute to the implementation of WIGOS, including WIGOS Manual, and provide relevant advice and support to the chairperson of ICT-IOS  <i>Expected Result 4</i>	Address relevant items of WIGOS Implementation Activities agreed by Congress XVI, and then ICG-WIGOS	Ongoing	Chair IPET-OSDE		GOS Manual and Guide to be reviewed, and made consistent with WIGOS Manual and Guide while avoiding duplication
2	Survey and collate user requirements for observations for WMO and WMO-sponsored programmes  <i>Expected Result 4</i>	Review and update WMO database of observational user requirements, through Points of Contact for application areas.	Ongoing / Annual review	Chair IPET-OSDE		
3	Survey and collate observing systems capabilities for surface-based and space-based systems that are components or candidate components of WIGOS  <i>Expected Result 4</i>	Review and update WMO database of observing system capabilities, in collaboration with other OPAG IOS ETs and other Technical Commissions as appropriate.	Ongoing / Annual review	Chair IPET-OSDE		
4	Maintain Rolling Review of Requirements (RRR) for observations in several application areas, using subject area experts, including appropriate liaison with Technical Commissions and programmes and co-sponsored programmes (e.g. CAS, JCOMM, CAeM, CAgM, CHy, CCI, GCOS, GFCS, and	Continue RRR process for the listed application areas and expand to new areas as required: review and update as necessary Statements of Guidance on the extent to which present/planned observing system capabilities meet user requirements, through Points of Contact on	Ongoing / Annual review	Chair IPET-OSDE		



	GCW) <i>Expected Result 4</i>	application areas.				
5	Prepare and maintain reviews of observation impact studies undertaken by NWP centres and provide information for consideration by IPET-OSDE and OPAG-IOS <i>Expected Result 4</i>	Rapporteurs on Impact Studies and NWP experts, review results of impact studies relevant to the evolution of observing systems.  Organize and hold next NWP Impact Studies Workshop in 2016.	2016: workshop	Rapporteurs on Scientific Evaluation of Impact Studies undertaken by NWP Centres		
6	Promote CBS activities in support of GCOS goals <i>Expected Result 4</i>	Review the implications of the progress on the GCOS Implementation Plan for the activities of CBS Bring relevant issues to the attention of the IPET-OSDE	2013	Rapporteur on GCOS matters		
7	Promote CBS activities in support of GFCS goals <i>Expected Result 4</i>	Review the implications of the GFCS IP for the activities of CBS Bring relevant issues to the attention of the IPET-OSDE	2016	Chair IPET-OSDE		
8	Promote CBS activities in support of GCW goals <i>Expected Result 4</i>	Review the implications for the activities of CBS of the GCW developments, including the GCW Implementation Strategy, and the Cryosphere theme report for the IGOS partnership Bring relevant issues to the attention of the IPET-OSDE	2016	Chair IPET-OSDE		

9	<p>Monitor progress and actions by Members and partner Organizations per the approved Implementation Plan for the Evolution of the global observing systems (EGOS-IP), fully responding to the “Vision for the GOS in 2025”,and promote activities in support of progress</p> <p><i>Expected Result 4</i></p>	<p>Seek feedback from National Focal Points, Expert Teams, relevant Technical Commissions, and other groups on the implementation of EGOS-IP, and keep the EGOS-IP progress report up to date. Initiate and monitor activities which promote progress.</p>	Ongoing / Annual review	Chair IPET-OSDE		
10	<p>Propose guidance regarding observing system network design principles</p> <p><i>Expected Result 4</i></p>	<p>Draft guidance document on network design (to be further discussed at IPET-OSDE-1 in 2014)</p>	End 2013	Chair IPET-OSDE		

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**APPENDIX IV**

**EGOS-IP ACTIONS RELEVANT TO THE WORK OF THE ET-SBO**  
*(Excerpt from the EGOS-IP)*

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## APPENDIX V

### COMPUTATION OF GENERIC CAPABILITIES ON THE BASIS OF SURFACE-BASED OBSERVING SYSTEMS METADATA

OSCAR/Surface shall use observational user requirements from OSCAR/Requirements in order to be able to perform the critical review by comparing the surface-based observing systems capabilities with the observational user requirements in terms of the database criteria for each observed variable:

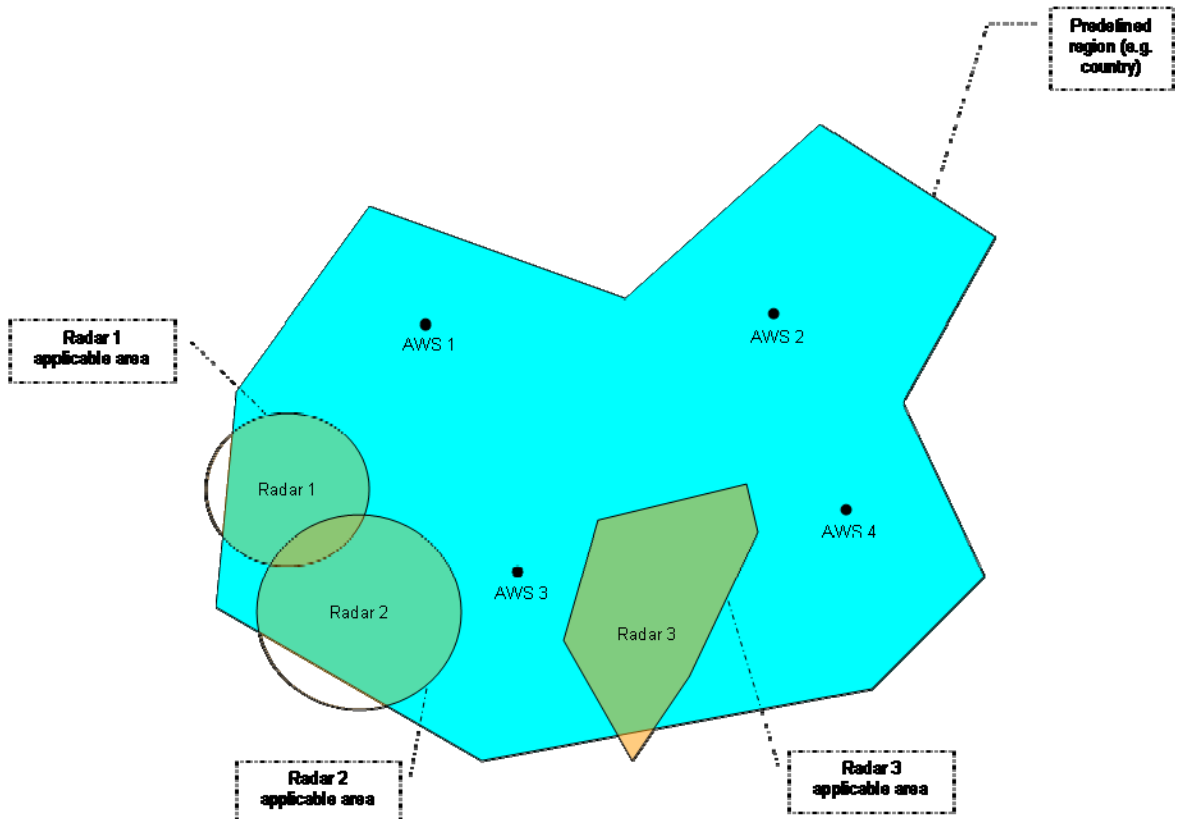
- Horizontal Resolution
- Vertical Resolution
- Observing cycle
- Uncertainty
- Timeliness
- Stability

Generic capabilities (typically for pre-defined geographic regions, and layers<sup>1</sup>) for a component observing system and a variable are derived automatically from the metadata of individual observing stations as described below.

- For a pre-defined geographic region, a layer, and a variable, the capabilities are computed automatically according to the following. A selection of relevant platforms measured variable capabilities for the considered layer is made according to the following criteria: (i) stations located in the considered pre-defined geographic region of Region\_area km<sup>2</sup>, (ii) stations of the considered platform type, (iii) stations declared operational in the database (operational status = OPER), (iv) station measured variable, with the sensor/instrument marked as functioning (operational status = OPER), and (iv) station measured variable capabilities for the considered layer.
- The total number of platforms ( $n$ ) corresponds to the number of unique virtual observing platforms returned by the query, and computed as following.
  - a. For platforms making measurements at a point (e.g. AWS, AMDAR), the number of virtual observing platforms is the number of actual observing platform of that type returned by the query.
  - b. For platforms making measurements within an applicable area (e.g. a surface radar, which observed area is defined by a polygon), the number of virtual observing platforms corresponds to the sum of virtual observing platforms equivalent to each of the actual selected platforms of that type. For one actual platform of that type, the number of virtual observing platforms corresponds to the total area (km<sup>2</sup>) of the applicable area of the actual station (e.g. the radar circle, or the region where the radar is said to report useful observations) intersected with the pre-selected region of interest (as defined by the query) divided by the square of the typical horizontal resolution (km) of the product (grid) of the considered platform measured variable layer.
  - c. The number of virtual platforms of type (a) and (b) above shall be added to obtain the total number of virtual platforms ( $n$ ).

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<sup>1</sup> For upper air and surface-based remotely-sensed systems, we will need to include the layers e.g. Low Troposphere, High Troposphere, Low Stratosphere



**Figure 2:** Example of applicable areas, and predefined regions. In this example, assuming Radars 1, 2, and 3 provide measurements for the considered variable at an horizontal resolution of 2km (i.e. typical product grid) if the applicable areas of Radar 1, 2, and 3 intersected with the predefined region are respectively 100 km<sup>2</sup>, 200 km<sup>2</sup>, and 120 km<sup>2</sup>, then their total number of virtual platforms in that region would be 25, 50, and 30 respectively. Assuming the 4 AWS also provide the measurements for the same considered variable, the total number of virtual platforms would therefore be 105 (radars) + 4 (AWS) = 109.

- Horizontal resolution shall be deduced for the pre-defined geographic region by computing the square root of the total area (km<sup>2</sup>) of the region divided by the number of virtual observing platforms meeting the selection criteriae within the region. Horizontal

$$\text{resolution (km)} = \sqrt{\frac{\text{Region\_area}}{n}}$$

- Vertical Resolution (m): A sub-selection is made for measured variables making profiles observations only (field profile = true). Vertical resolution is computed as the average vertical resolution of all returned measured variables weighted by their number of observations per minute (i.e. 1 / OC), i.e. Vertical Resolution =

$$\frac{\sum_{i=1}^r \left( n_i \times \text{Vertical\_resolution}_i / OC_i \right)}{\sum_{i=1}^r n_i / OC_i}$$

Where  $n_i$  is the number of virtual observing platforms for each actual platform, and  $OC_i$  is the observing cycle of the actual platforms returned by the query.

- Observing cycle (min) = inverse of the average number of observations per minute of all

returned measured variables = 
$$\frac{n}{\sum_{i=1}^r \frac{n_i}{OC_i}}$$

- Timeliness = average of the timeliness of all returned virtual measured variables

weighted by their number of observation per minute = 
$$\frac{\sum_{i=1}^r n_i \times Timeliness_i / OC_i}{\sum_{i=1}^r n_i / OC_i}$$

- Uncertainty = average of the uncertainty of all returned measured variables weighted by

their number of observation per minute = 
$$\frac{\sum_{i=1}^r n_i \times Uncert_i / OC_i}{\sum_{i=1}^r n_i / OC_i}$$

- Stability = average of the stability of all returned measured variables weighted by their

number of observation per minute = 
$$\frac{\sum_{i=1}^r n_i \times Stability_i / OC_i}{\sum_{i=1}^r n_i / OC_i}$$

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