GCOS & ECV TABLES

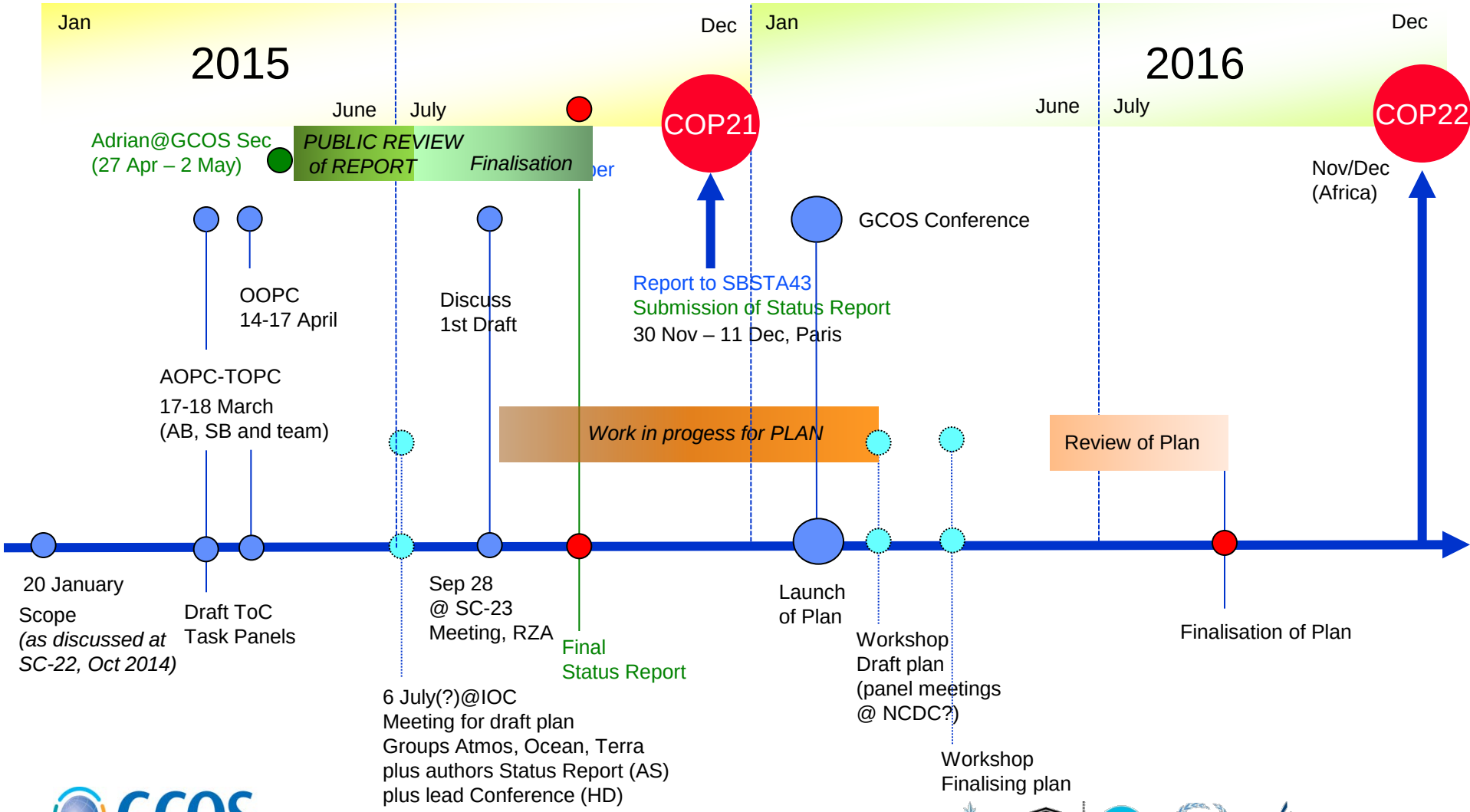
GRUAN ICM-7

Matera, Italy 23rd – 27th February, 2015

Tim Oakley, GCOS Network Manager

GCOS to submit a Third Report to Subsidiary Body for Scientific and Technical Advice of the UNFCCC SBSTA in 2015, and a new Implementation Plan in 2016, with a draft of the latter encouraged to be provided one year before.

Road Map for the new Plan (2015 – 2016)

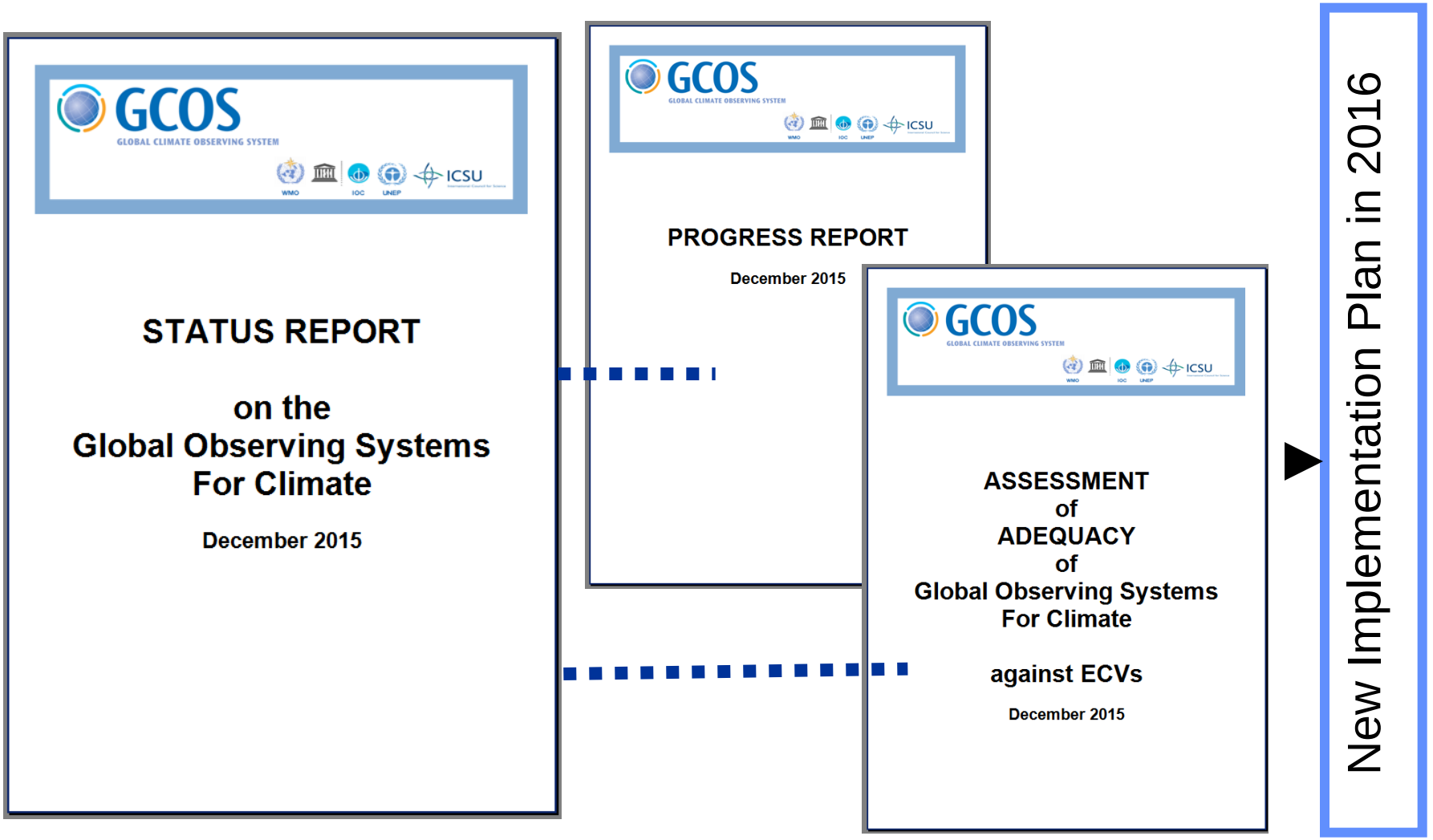


GCOS
GLOBAL CLIMATE OBSERVING SYSTEM

WMO UNESCO IOC UNEP ICSU International Council for Science

updated@26 Jan 2015

Next Status Report and New Implementation Plan



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ATMOSPHERE – Upper air

Name of ECV	**Temperature**
Subsidiary variables	**Not applicable**
Supplementary measured variables	Upwelling and downwelling IR and MW radiances. GPS bending angles, lidar and microwave radiometers.
ECV Group membership	Energy budget
Applications	Climate trends, input to reanalyses, model validation
Phenomena and indices	Lapse rates (esp. 'tropical hotspot'), thermal winds?
Uncertainties identified by IPCC	IPCC AR5 key uncertainty: "There is only medium to low confidence in the rate of change of tropospheric warming and its vertical structure. Estimates of tropospheric warming rates encompass surface temperature warming rate estimates. There is low confidence in the rate and vertical structure of the stratospheric cooling." A recent assessment by Simmons et al. paints a rather more confident picture for the stratosphere.
Pre-existing summary text on the ECV	*From 2011 Sat Supp (update as needed):* Data on upper-air temperatures are of key importance for detection and attribution of tropospheric and stratospheric climate change. Upper-air temperatures are crucial for distinguishing the various possible causes of climate change and for the validation of climate models, and they can potentially be used for improved understanding of long-term variability in atmospheric circulation. Changes in upper-air temperatures are also crucial for understanding changes in water vapour in the lower stratosphere (Section 3.1.5), and for reconciling ozone trends between different satellite instruments. Temperatures measured by radiosondes provide the longest available

Non-climate applications of observation	*From 2011 Sat Supp (update as needed):* • GPS-RO has potential for monitoring height of inversion layers (i.e., the tropopause and boundary layer, tropopause over-folding etc.) • NWP, Nowcasting, Aviation, Satellite Bias Correction….
Contributing observing networks, systems or approaches	From IP-10 *Please update*

Contributing Network(s)	Status	Contributing Satellite Data	Status
Reference network of high-quality and high- altitude radiosondes (GRUAN).	A first reference quality radiosonde stream has been produced. Work is ongoing to develop lidar and microwave radiometer streams and streams for additional radiosonde types.	Microwave sounders Infrared sounders GNSS radio occultation.	(Continuity assured) for operational microwave and IR sounders in 3 polar orbits; Continuity for GNSS RO constellation still needs to be secured
GCOS Upper-Air Network (subset of full WWW/GOS radiosondes network)	About 90% of stations are reporting regularly. Currently little active monitoring of data quality in either NRT or delayed mode.		
Full WWW/GOS radiosonde network.	Many stations do not provide two observations each day.		
Commercial aircraft.	Aircraft observations are valuable but limited to specific routes and levels except near airports.		
Ground-based remote sensing	National and international lidar		

Links and references to observational methods and standards	Dirksen et al., 2014 describes the GRUAN data stream for temperature measures. CIMO intercomparisons provide good information on relative performance of operational radiosonde models
Requirements for spatial and temporal scale, accuracy/uncertainty and stability	*Use OSCAR but note GCOS needs to own and update the climate entries.* *GCOS-112 in its appendix provides requirements for GRUAN profiles which represent perhaps the ultimate goal target in terms of quality globally.*
Arrangements for observational monitoring	*Satellite IR and MW sounder monitoring at NWP SAF site given in links below.* GRUAN data actively monitored GUAN receipt and some aspects of the quality monitored by GUAN monitoring centres. GSICS? See link below for satellite data monitoring.
Changes in observation	*Change from MSU to AMSU and ATMS* *Change from HIRS to IASI, AIRS and CrIS* Upcoming change from RS-92 to RS-41 to affect c.70% of radiosonde network.
Observational performance	*Satellite polar sounders 4X daily* *IR sounders 0.2K/1km* *MW sounders 0.2K/3km*
Data recovery	*VTPR, IRIS, SSM/T, SCAMS, PMR, for ERA, old radiosondes for ERA-CLIM1/2*
Data centres	NCDC, CLASS, reanalyses centres
Data products	*Satellite TOA radiances* *Bending angles from GPS-RO* *Radiosonde temperature datasets (HadAT, RATPAC, RAOBCORE,*

Product oversight and coordination	*Climate Research community* *Inputs on product accuracy from CIMO, CBS, ITWG*
Product assessments	*CIMO radiosondes intercomparisons, Reanalysis comparisons, In-situ and satellite dataset comparisons*
Action from IP-10 The first five of these actions are general for upper-air data	**Action A15:** Improve operation of the GUAN, including infrastructure and data management. **Who:** Parties operating GUAN stations, in cooperation with GCOS Secretariat and WMO CBS. **Time-Frame:** Ongoing. **Performance Indicator:** Percentage of data archived in WDC Asheville. **Annual Cost Implications:** 10-30M US$ (80% in non-Annex-I Parties).

	Action A16: Continue implementation of the GCOS Reference Upper-Air Network of high-quality radiosondes and other supporting observations, including operational requirements and data management, archiving and analysis. **Who:** National Meteorological Services and research agencies, in cooperation with AOPC,

Assessment of progress on action	A15: Improved data receipt at many problematic stations (see AOPC monitoring reports) but little attention paid to data quality or feedback on data quality to sites. A16. Substantial progress with data stream development. Still require additional sites and bringing to completion of several products. A17. Poor. Only a handful of NMSs are sharing in full BUFR and users are poorly equipped to ingest this. Many NMSs are simply sending TEMP messages dressed in BUFR which brings no progress. A18. Minimal. Some additional metadata and data to NCDC but in reality little progress A19. No real progress on securing funding for CLARREO or TRUTHS. Important to stress that the value of a cal/val system should be that it is a truly multi-point system with a ground segment (GRUAN), a satellite segment (CLARREO/TRUTHS and GPS-RO) and an intercomparison segment (GSICS). See recent WIGOS sponsored workshop outcomes. A20. Continued MW sounder data on METOP, EPS-SG, FY3 and JPSS. FCDRs for AIRS and IASI being generated. A21. COSMIC-2 to replace COSMIC has been partly funded (tropical constellation) but not high latitude satellites. New FY satellites carry GNSS

<table>
<tr><td></td><td>receivers.</td></tr>
<tr><td>Product requirement from 2011 Satellite Supplement</td><td>
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<tr><th>Variable/ Parameter</th><th>Horizontal Resolution</th><th>Vertical Resolution</th><th>Temporal Resolution</th><th>Accuracy</th><th>Stability</th></tr>
<tr><td>Tropospheric temperature profile</td><td>25km</td><td>1km</td><td>4h</td><td>0.5K</td><td>0.05K</td></tr>
<tr><td>Stratospheric temperature profile</td><td>100km</td><td>2km</td><td>4h</td><td>0.5K</td><td>0.05K</td></tr>
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This should be consistent with OSCAR.</td></tr>
<tr><td>Progress towards meeting product requirement</td><td>China has indicated it will put its polar orbiting satellite in a complementary orbit to ensure 4hr temporal resolution. MW sounders in 2 polar orbits at present.</td></tr>
<tr><td>General links and references</td><td>http://research.metoffice.gov.uk/research/interproj/nwpsaf/monitoring.html
www.gruan.org
http://nwpsaf.eu/monitoring.html</td></tr>
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