

AOPC Report GCOS SC 27

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October 2019

Paris, France



**GLOBAL CLIMATE
OBSERVING SYSTEM**

KEEPING WATCH OVER OUR CLIMATE



WMO



IOC

International
Science Council



UN 
environment

- Organisation
- AOPC24 Actions
- IP Actions
- Atmospheric ECV
- Networks
- Task Teams
- C3S Update
- WGClimate Update
- Future Plans

- AOPC24: Marrakesh, JPM - March 2019
- IP rapporteurs
- ECV stewards
- Frequent inter-sessional webex meetings
 - Regular teleconferences with Chairs and Secretariat (ca every 2 weeks)
 - Full panel webex meetings every three months
 - Webex with small group of panel members as needed
- AOPC25: Maynooth University, Ireland, 20-24 April 2020 (proposed)
- New panel members to be considered when implications of WMO restructuring is known

AOPC MEMBERSHIP							
	NAME	Affiliation	ORIGIN, COUNTRY	SPECIALTY/ EXPERTISE	MEMBER SINCE	ATTENDANCE (as of 4/2019)	STATUS (membership subject to review by GCOS and JSC)
1	Kenneth HOLMUND (Chairman)	EUMETSAT- International	Finland	EO Satellites	2014	6 out of 6	Chairman after 2014 session
2	Peter THORNE (co-chair)	Maynooth University- Ireland	UK	Upper-Air / Surface references	2016	4 out of 4	2nd Duty Cycle will end after 2021 session
3	Peng ZHANG	National Satellite Meteorological Center Beijing, China	China	satellites	2016	4 out of 4	2nd Duty Cycle will end after 2021 session
4	Shinya KOBAYASHI	JMA-Japan	Japan	Reanalysis	2017	3 out of 3	1st Duty Cycle will end after 2019 session
5	Elizabeth KENT	NOC-UK	UK	Air-sea interaction	2017	3 out of 3	1st Duty Cycle will end after 2019 session
6	Rainer Hollmann	Deutscher Wetterdienst Germany	Germany	CM-SAF cloud remote sensing (surface radiation)	2018	2 out of 2	1st Duty Cycle will end after 2020 session
7	Dale Hurst	NOAA Earth System Research Laboratory- USA	USA	Atmospheric composition	2018	2 out of 2	1st Duty Cycle will end after 2020 session
8	Imke Durre	NOAA/NESDIS/NCEI/ CWC-USA	USA	Climate data records	2018	2 out of 2	1st Duty Cycle will end after 2020 session
9	Johanna Tamminen	FMI	Finland	Aerosols/satellite	2019	1 out of 1	1st Duty Cycle will end after 2021 session

Main topics at AOPC24 – Activities for AOPC

- ECV
 - ECV definition/requirements (OSCAR) **A key focus for AOPC**
- Implementation Plan
- Network updates
 - BSRN, GSN, GUAN, GRUAN, (CEOS/CGMS JWGClimat)
- Task Teams
 - GCOS Surface Reference Network
 - Lightning
 - Radar
 - GUAN

Mapping of ECV product with OSCAR variables: names, units and definitions

- Annex A IP : ECV products in GCOS 200
https://library.wmo.int/opac/doc_num.php?explnum_id=3417
- AOPC and ECV stewards have delivered definitions for the ECV products and added new products when necessary
 - **Lightning was introduced in 2016 IP, now Schumann-resonance is an emerging ECV**
- Tables were reviewed at the IPET-OSDE Workshop on OSCAR/Requirements held in Geneva on December 3-4 2018.
- Most of the definitions proposed by AOPC have been accepted by IPET-OSDE and will be implemented in OSCAR/requirements, including new vertical levels definition.
 - **e.g. relative humidity, temperature@2m now temperature@known_height**
 - **5 layers for all upper air ECVs**
- AOPC and ECV stewards are working to review the existing requirements, assessing if they are still fit-for-purpose and proposing refinements in consultation with their respective communities.
- For ECV for atmospheric composition and aerosols a joint task team with GAW has been established to ensure consistency within the requirements.

- December 2019: updated requirements ready.
- January 2020 to April 2020 (AOPC panel meeting): Public Review of initial proposed ECV requirements with all the relevant communities specifically invited.
- AOPC panel meeting 2020: Consider responses to ECV requirements, identify areas for further work
- May-Aug 2021: Draft revised IP4 will incorporate the revised ECV requirements that have been developed since 2019.
- Update of GCOS IP (2022): **reviewed/updated requirements will be used for the OSCAR/requirements (implies no improvement until then)**

Current OSCAR inputs are based on IP2016 and do not reflect current consolidated panel view. Many products (especially for the atmospheric and terrestrial variables) were not added as they have different names, definitions or units than the correspondent variable in OSCAR. OSCAR/requirements table not complete. **e.g.**

- **precipitation rate vs accumulation**
- **inconsistent variables**
- **single values (not three)**
- **resolution**

GUIDENCE GCOS SC required

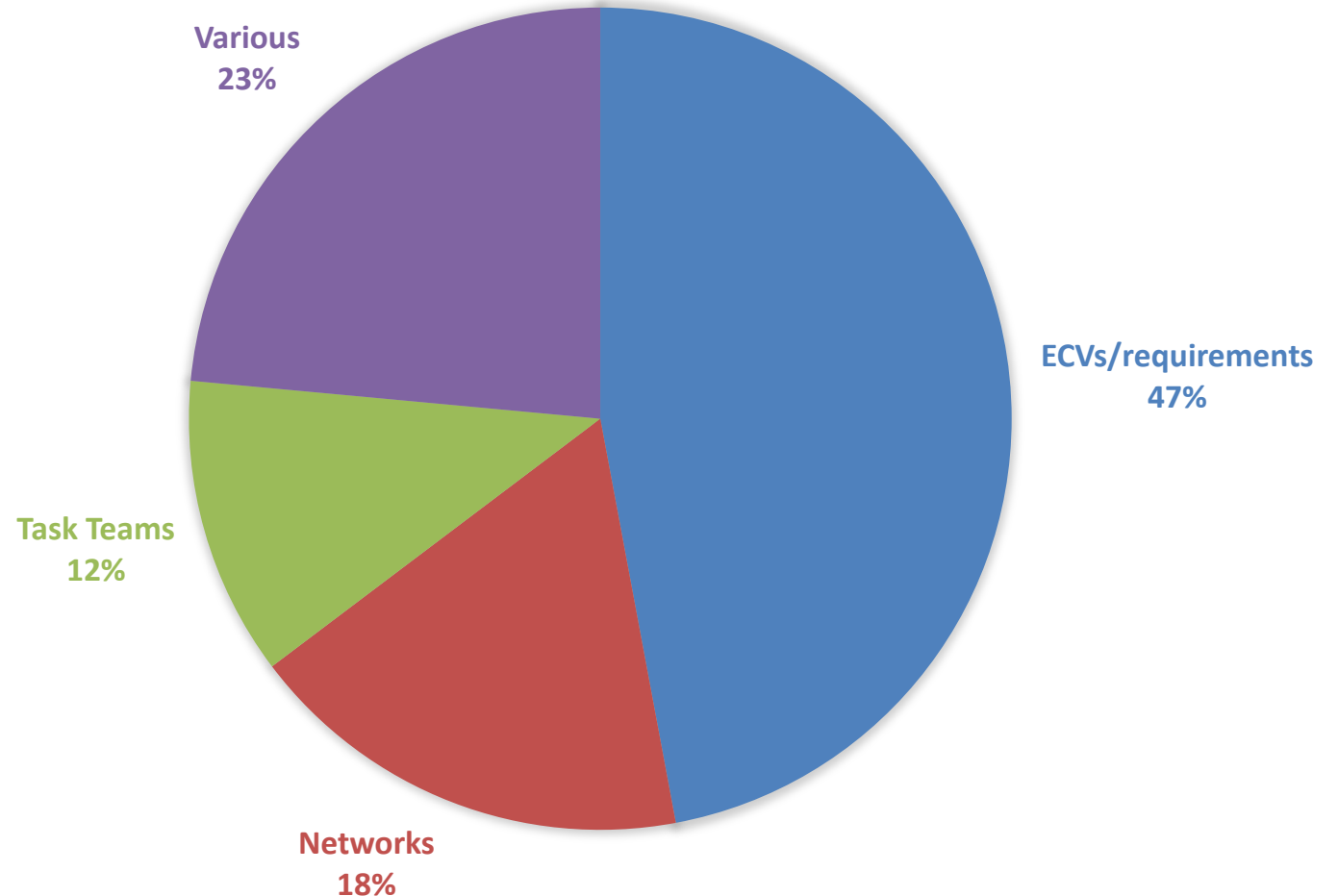
Review/update of ECV requirements

ECV	ECV Steward	Status
Wind speed and direction (surface)	Phil, Liz	Completed
Temperature (surface)	Phil, Liz	Completed
Water vapour (surface)	Liz, Phil	Completed
Pressure (surface)	Liz, Phil	Completed
Precipitation	Rainer, Markus	In progress
Surface Radiation Budget	Rainer	In progress
ERB	Peng	In progress
Wind speed and direction (upper-air)	Shinya, Peter	Completed
Temperature (upper-air)	Peter, Imke	Completed
Water vapour (upper-air)	Dale, Imke	Completed
Clouds properties	Rainer	Not started yet
Lightning	Bob	Completed
Ozone	Dale, Paolo	Working with GAW/in progress
CO2,CH4 and other GHG	Johanna, Dale	Working with GAW/in progress
Aerosols properties	Paolo, Peng	Working with GAW/in progress
Precursors	Johanna, Paolo	Working with GAW/in progress

AOPC 24 – Status of Actions

- All Actions from AOPC-23 were closed
- 17 New Actions
 - 3 completed
 - 14 Started and ongoing
- 8 on ECVs and requirements
 - ECV requirements/OSCAR
 - ECV for adaptation
 - Cross-cutting for air-sea fluxes
- 3 on networks
 - GSRN, GBON
- 2 Task Teams
 - Radar Task Team
 - Lightning Task Team
- 4 Various

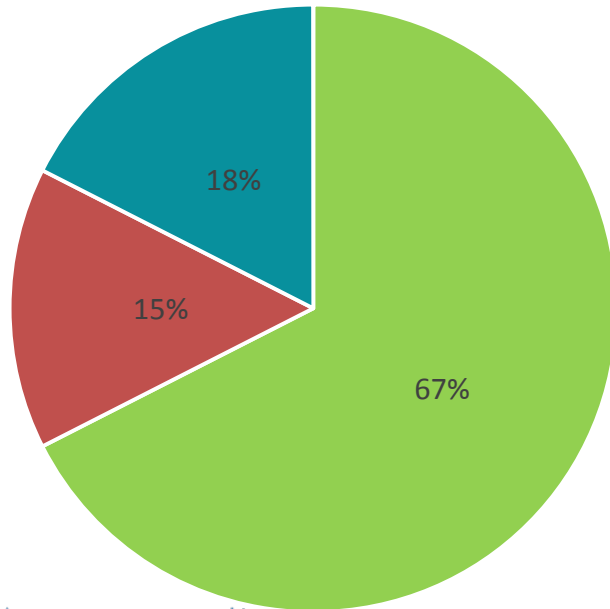
AOPC24



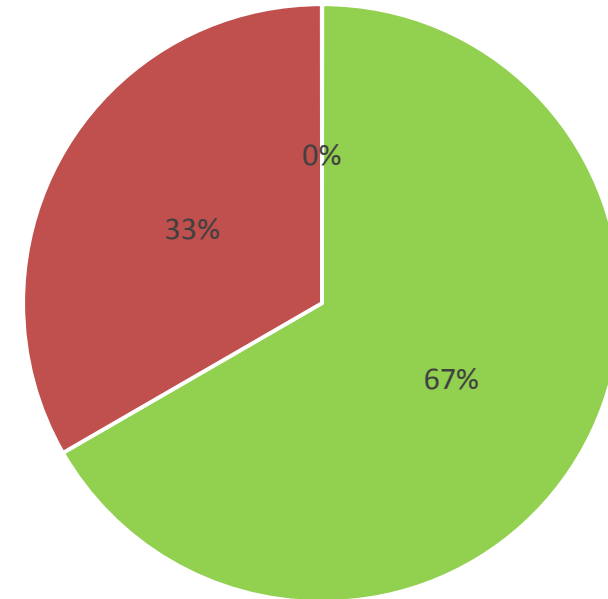
- IP rapporteurs within AOPC have been identified
 - Better formulation of the IP actions
 - Regularly updates description of the status of the action itself.

■ 40 Actions

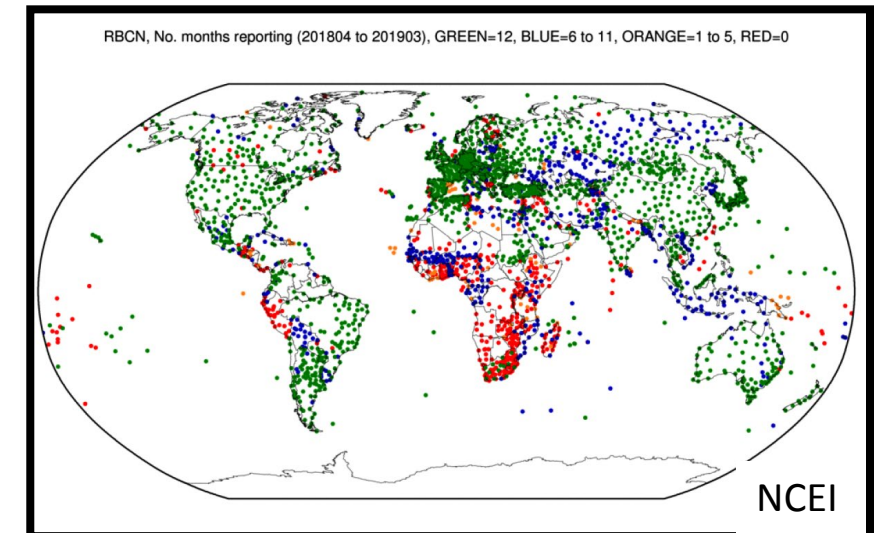
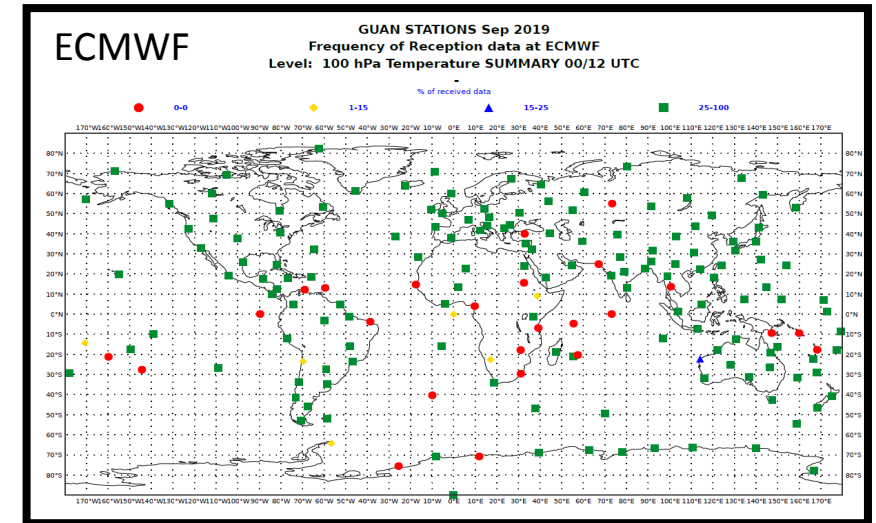
AOPC2019



AOPC2018



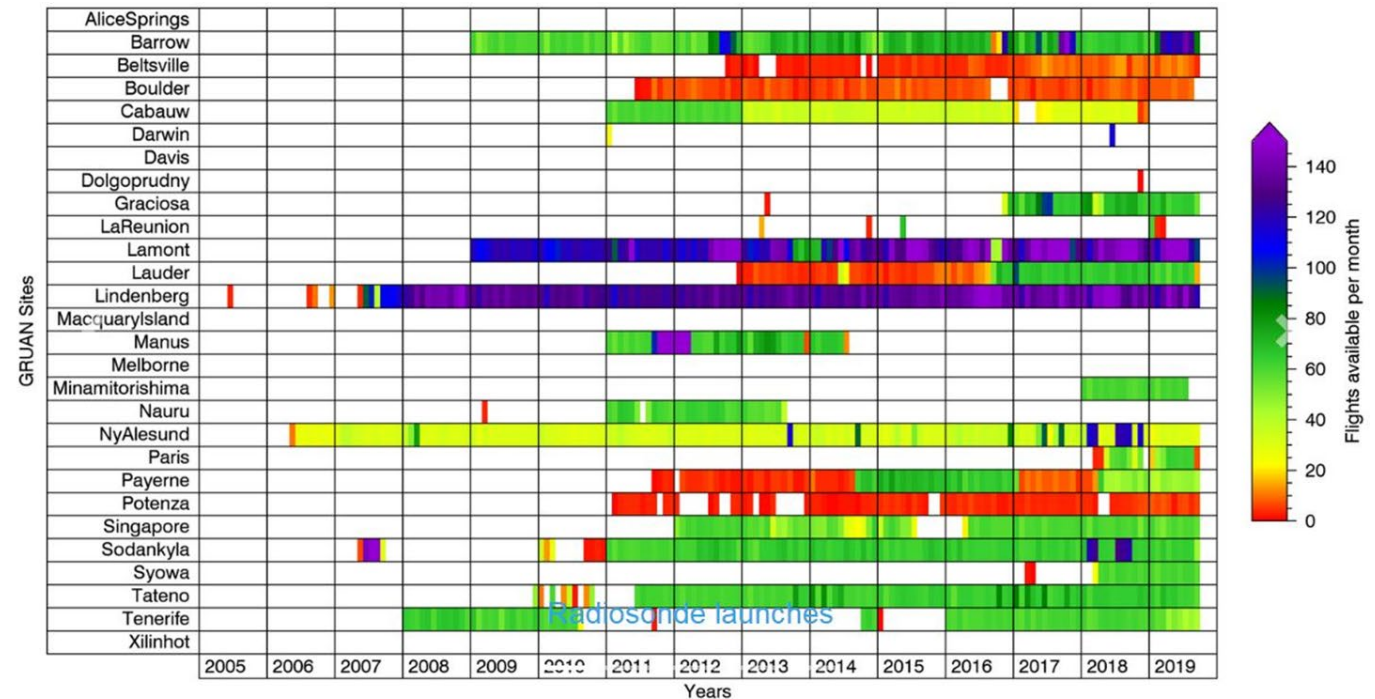
- 2019 Monitoring shows further deterioration in data availability.
- Radiosonde observations in Africa and SIDS (Small Island Developing States) of particular concern.
- Resources and equipment maintenance remain primary factors, but reduced bi-lateral aid an increasing factor.
- GUAN/GSN performance a key indicator for a number of IP actions.
- Will discuss following agenda 8.2/8.7
 - (GBON/GCM)



ICM 11: Singapore, 20-24 May 2019

- Network expanding
- DWD continues supporting the Lead Center, one staff position added
- Transition from RS92 to RS41 has been at center of GRUAN work-RS41 Data Product to be certified and publicly available by November 2020

Radiosonde launches through September 2019 (N = 97,992)



Priorities for 2019:

- First full version of RS41 GDP
- Radiosonde fundamental documentation
- ARL (Automatic Radiosonde Launcher). Complete and submit the draft paper on ARL effects. Make recommendations on next steps to certify the ARL data
- Develop GNSS, Lidar and CFH/FPH data products
- Recruit candidate sites in the tropics, S. America and Africa

ICM-12: La Reunion, November 2020 – (18 months from ICM-11)

At the 22nd session of the AOPC meeting (AOPC-22, 2017), four task team were proposed to address some of the topics discussed at the meeting. The Task Teams were give a mandate of 2 years.

TASK TEAMS:

- The use of Weather Radar for Climate Studies
- The instigation of a GCOS Surface Reference Network
- Lightning Observations for Climate Applications
- The GCOS Upper Air Network (GUAN)

Task Team on the use of Weather Radar for Climate Studies

Initial tasks accomplished.

- Report has been published (GCOS-223). Includes:
 - Weather radar data requirements for climate monitoring, define relevant metadata, and define best practices.
 - Assess the status of existing international and national archives, including their accessibility, extent and quality.
 - Provide guidance how to organize proper and standardized storage and user interface of local radar data and metadata for eventual reprocessing at a later stage to support climate monitoring.
 - Suggest procedures for handling historical data.
- BAMS paper published: An Overview of Using Weather Radar for Climatological Studies: Successes, Challenges, and Potential Radars ready for Climate (<https://doi.org/10.1175/BAMS-D-18-0166.1>)
- **Recommendation: international portal to allow harmonized access to radar data, metadata and documentation.**

Follow-up of this TT

- Coordination with WMO to decide responsibilities to implement recommendations of this TT.
- Proposal for a portal for climate radar data: the correct terms for this recommendation need to be formulated, submitted to WMO and worked together with the Inter-Programme Expert Team on Operational Weather Radars (IPET-OWR)
- **Task Team closed**

The GCOS Surface Reference Network (GSRN)

- Report of the Task Team outlining the scientific rationale, the benefits, the metrological understanding, siting and instrumentation and next steps is published as GCOS-226.
- GSRN will support WMO Integrated Global Observing System aiming to meet the “goal” requirements in the WMO OSCAR requirements database. It is proposed that the GSRN be sponsored by WMO and the Bureau International des Poids et Mesures (BIPM).
- Next steps:
 - Achieve approval of the proposed GSRN by relevant WMO programmes, the GCOS programme and other sponsors;
 - Identify and receive an offer to host and staff appropriately a Lead Centre;
 - One or more centers could be considered
 - Acquire offers of suitable sites for an initial GSRN.
- **Task Team will exist for 2 additional years to support the first phase of implementation**
- Presentation later in meeting – 8.3

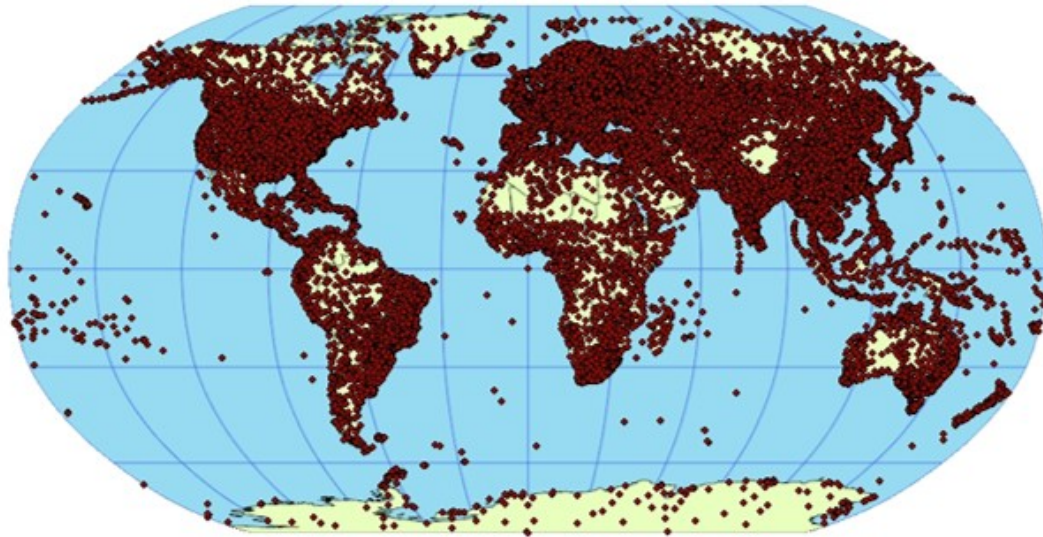
Task Team on Lightning Observations for Climate Applications (TTLOCA)

- Lightning for Climate Report was published ([GCOS-227](#)), includes recommendations.
- To make the results more visible and have a more scientific underpinning, AOPC asked TTLOCA to prepare a scientific article.
- Initiative to create Thunder Day database, used as proxy to extent lightning data back in time -> hosted by MIT, USA; currently being transferred to WMO WIS database through GEO.
- Thunder data database established
- Initiative to use GRUAN for a field campaign to measure the global vertical electric field as indication about global thunderstorm activity
- AOPC encourages the task team to continue its work -> **invited to propose revised terms of reference and a new list of membership to next AOPC.**
 - Engage with CIMO and the expert team on Surface Based Observations (ET-SBO) and form a joint task team.
 - Need to raise awareness of the need to collect lightning data for climate purposes

The GCOS Upper-Air Network Task Team (GUAN TT)

- The ongoing value of the GUAN was supported by the Global Basic Observation Network (GBON) meeting (July 2018). WMO reinforced the benefits of GUAN.
- GCOS will work on an updated GUAN in collaboration with the GBON proposal
- GUAN should either be a baseline component of GBON or it should be replaced with GBON
- Presentation on GBON and the role for GCOS in GBON (8.2)
- AOPC co-chair and GCOS Network Manager will attend upcoming meeting GBON Preparatory Meeting in Geneva, 19-21 November 2019
- **Task Team closed**

Progress on access to land observations

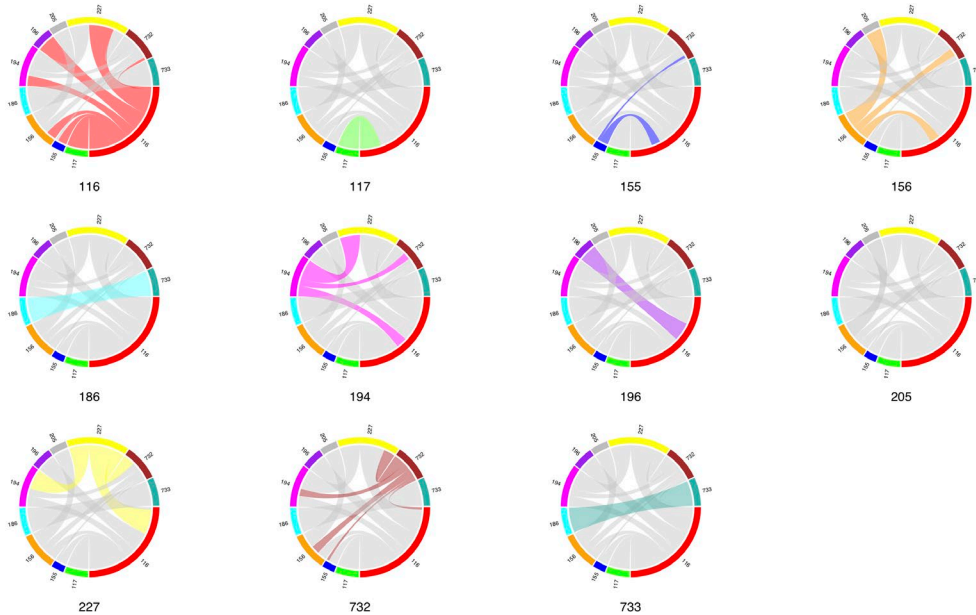


- Aim is to create multi-ECV cross-timescale holdings
- In excess of 350 land data sources secured
 - More being secured all the time
 - Web-based deposition service with several modalities about to go live
- Work ongoing to merge these sources (many are grossly duplicative)
- QC/QA ongoing development
- Incremental releases
- Focus is on sub-daily holdings as lowest maturity but important to inform reanalysis efforts

Progress on marine holdings management

- Reprocessing of ICOADS Rel.3.1
- Pulling out supplementary reports not considered in earlier releases
- Improved ship tracking
- Improved duplicate identification
- Improved quality control
- Incremental reprocessing back in time

Output of duplicate identification 1950 to 1959



Major objectives of WGClimate

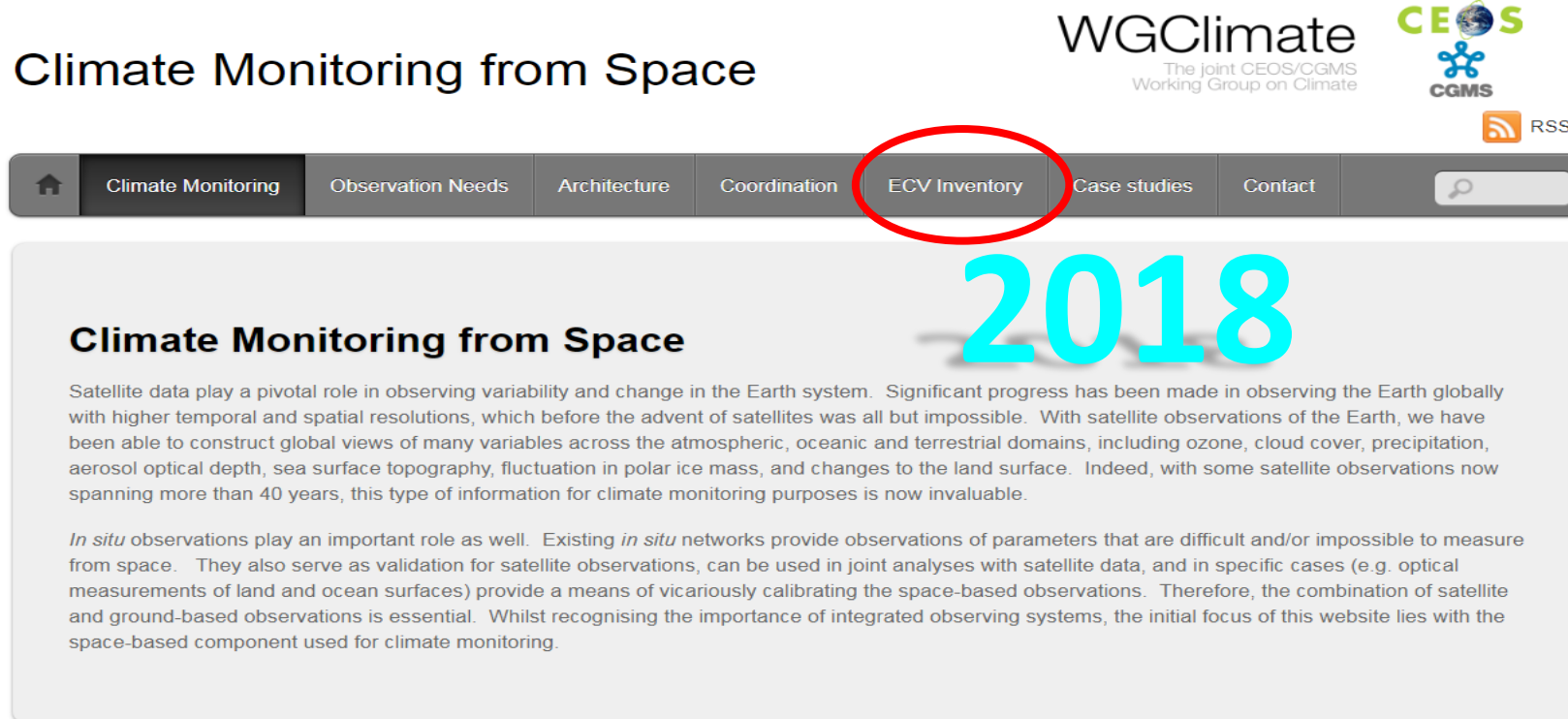
- Provision of a structured, comprehensive and accessible view as to what Climate Data Records are currently available from satellite missions of CEOS and CGMS members or their combination;
- Creation of the conditions for delivering further Climate Data Records, including multi-mission Climate Data Records, through best use of available data to fulfil GCOS requirements (e.g. by identifying and targetting cross-calibration or re-processing gaps/shortfalls);
- Optimisation of the planning of future satellite missions and constellations to expand existing and planned Climate Data Records, both in terms of coverage and record length, and to address possible gaps with respect to GCOS requirements.

Addition to the Mandate 2018

Considering the specific importance of greenhouse gas monitoring as stated in the Conference of the Parties (COP) 21 Paris Agreement, it will:

- Coordinate activities of CEOS and CGMS defining and implementing an integrated global carbon observing system including a targeted observing system for monitoring the column concentrations of CO₂, CH₄ and other greenhouse gases from space as well as insuring that these activities are integrated into a broader approach on greenhouse gas monitoring, i.e., WMO IG³IS, GCOS, and GEO-C;
- Oversee the implementation of the CEOS Carbon strategy.

JWG Climate ECV Inventory Access



The screenshot shows the website header with the title "Climate Monitoring from Space" and the WGClimate logo. The navigation menu includes "Climate Monitoring", "Observation Needs", "Architecture", "Coordination", "ECV Inventory" (circled in red), "Case studies", and "Contact". The main content area features a large "2018" graphic and a section titled "Climate Monitoring from Space" with introductory text about satellite data and *in situ* observations.

- Public access to Inventory via <http://climatemonitoring.info>
- Users can:
 - Download the ECV Inventory content for own analysis;
 - Find direct access points to all CDRs in the Inventory;
 - Get access to WGClimate gap analysis results and planned actions;
 - Can access case studies analysing the use of CDRs for applications.

Access to data from the ECV Inventory

Existing data records | Planned data records

Existing data records

Show **All** entries

RecordID	Details	tempCov	Domain	ECVName	ECVProduct
10138	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Extent/E
10145	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Drift
10149	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Extent/E
10258	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Drift
10259	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Drift
10302	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent
10305	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Extent/E
10490	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Thickne
10491	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Thickne
10675	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent
10677	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent
10795	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Extent/E
11009	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Thickne
11010	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Thickne
11015	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent
11053	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent
11502	🔗	🔗 >>	Ocean	Sea Ice	Sea Ice Concent

Showing 1 to 17 of 17 entries (filtered from 496 total entries)

17.09.2018 14:27:05

Existing data records | Planned data records | **Details (existing)** | Temporal Coverage

Detailed information for existing data record

Refresh

Record Information | Stewardship | Generation Process | Record Characteristics | Documentation

Accessibility | Applications

Access point	osisaf-manager@met.no	
Access conditions	Type of access	Free and unrestricted access
	Restrictions to access	
	Registration / ordering	Open access to data through ftp
Data record (link)	ftp://osisaf.met.no/reprocessed/ice/conc/osi-409-a	
FCDR availability (link)	http://www.remss.com/measurements/brightness-temperature#TB_Access	
Data format and metadata standard	Data format	NetCDF
	Metadata standard	CF
Dissemination mechanisms	FTP	
Release date (yyyy)	2015	

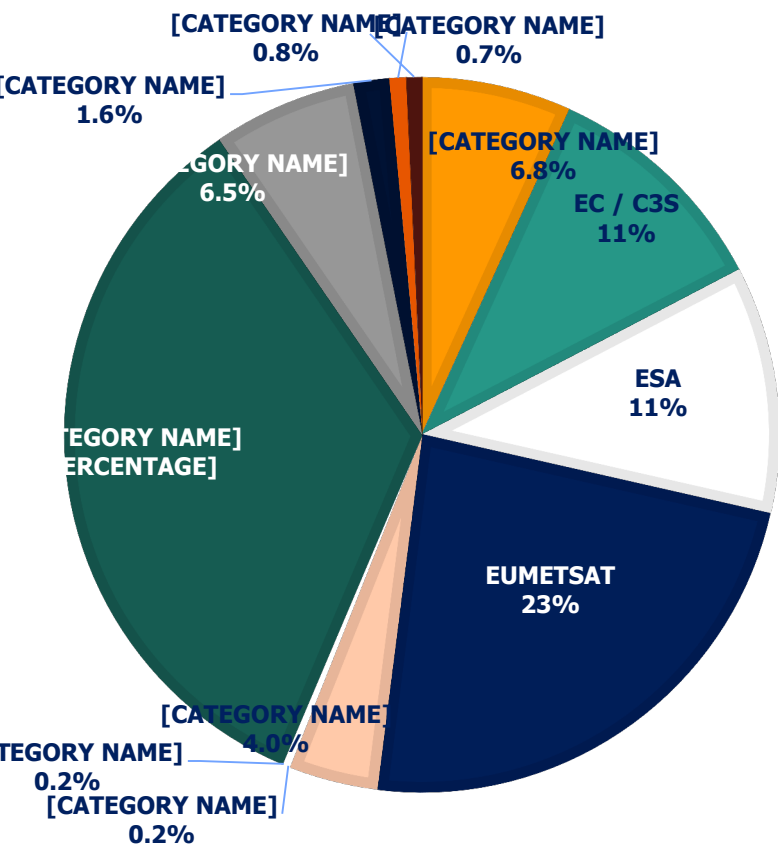
17.09.2018 14:29:41

Filter:

- RecordID = 10675

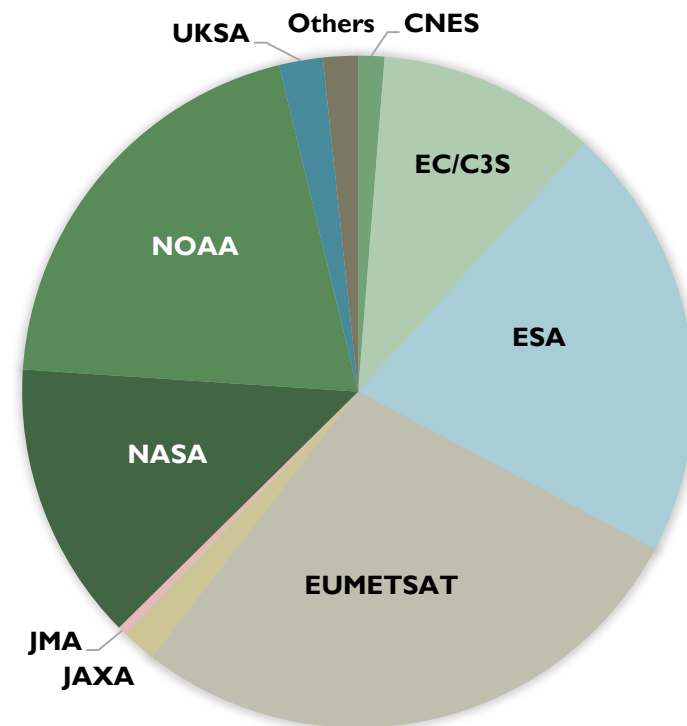
Global partnership Architecture for monitoring climate from space

Updated inventory: 1300 Climate Records of ECVs (821 existing & 479 planned)

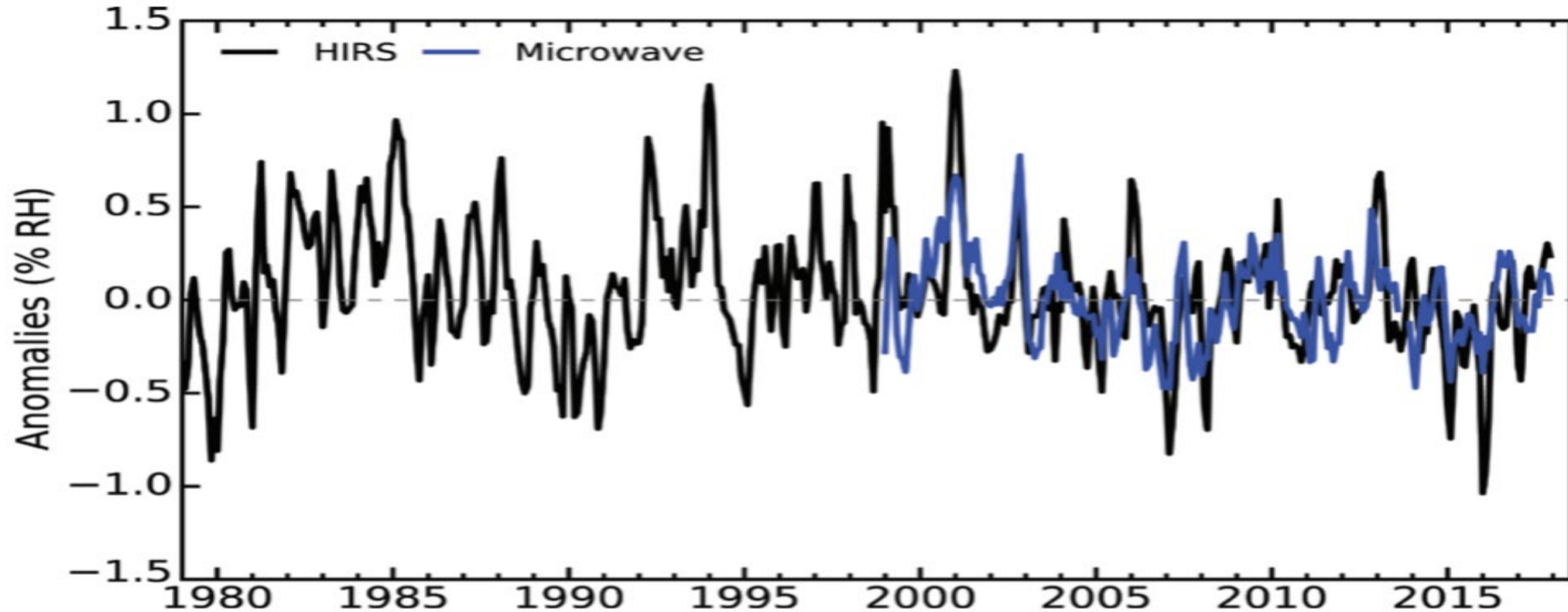


- 35 ECVs covered (+4) out of 53
- EUMETSAT contributes 310 CDR (+72) for 25 ECVs
- 464 CDRs use EUMETSAT data

Contributions of CDRs longer than 30 years



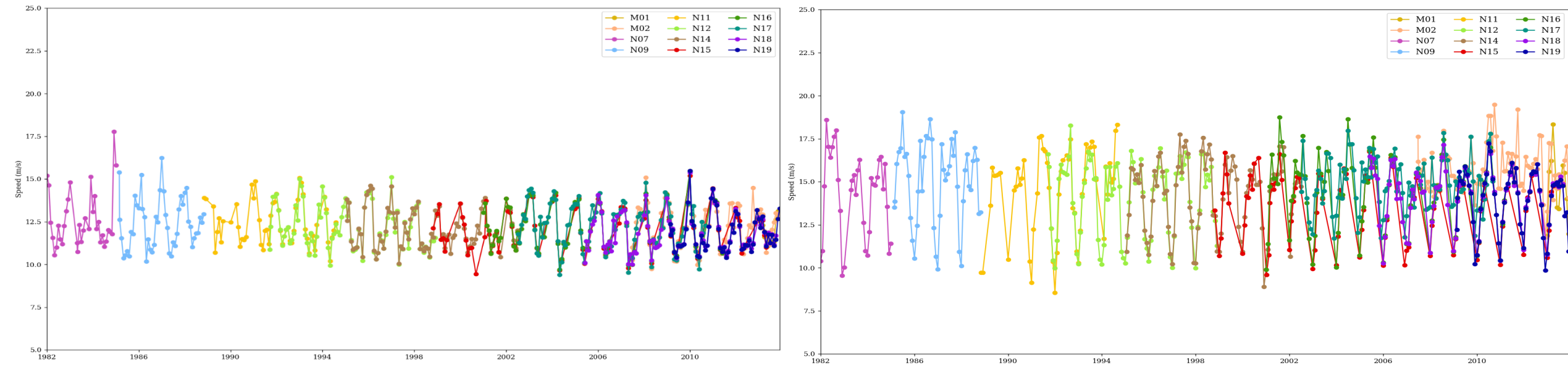
Upper tropospheric humidity with HIRS and MHS



Time series of upper tropospheric humidity anomalies using HIRS (black) and microwave sounder (blue) datasets. Figure shows the area-weighted mean deseasonalized anomaly time series of UTH for 60°N–60°S. The anomalies are computed with respect to the 2001–2010 average, and the time series are smoothed to remove variability on time scales shorter than three months.

John et al., 2018: State of the Climate 2017, BAMS.

Polar Atmospheric Motion Vectors from AVHRR



33 years (1982-2014) time series of the wind speed (m/s) of AMVs over the Arctic (left) and Antarctica (right). Note that only AMVs with a quality index higher than 50 and a speed higher than 2 m/s are considered.

Doutriaux-Boucher et al., 2018

Future Plans

- Complete requirements, including review
- Continue working with the GSRN Task Team and the Lightning Task Team.
- Identify how best to include results of the radar Task Team within WMO
- Continue working on IP actions
- Begin work for the Status Report
- Continue collaboration with WIGOS on GBON
- Continue collaboration with GAW on updating requirements for Atmospheric Composition ECV (Coordination of GAW/GCOS Task Team on RRR)