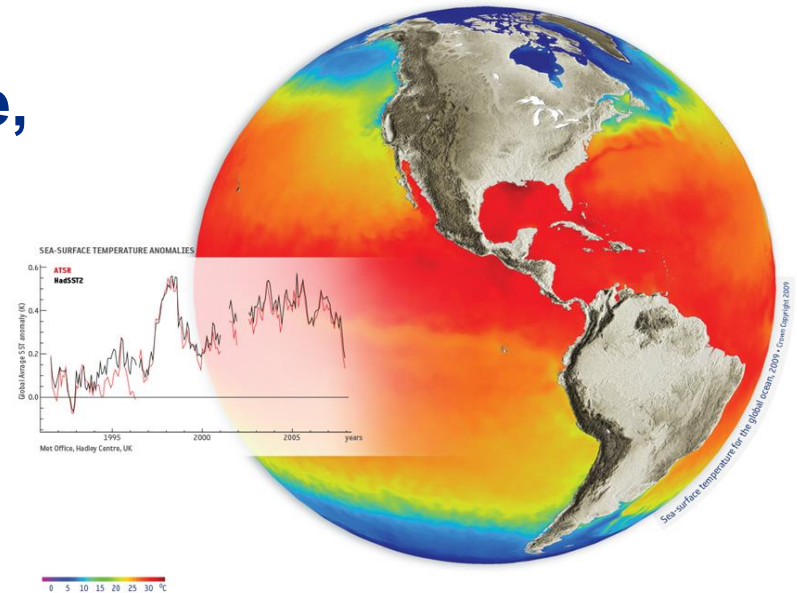




CEOS SST-VC: Achievements in 2013

**2nd SST-VC meeting, Woods Hole,
USA 21st June 2013**

Craig Donlon (ESA)
Kenneth S. Casey (NOAA)





- Introduction
- CEOS
- SST-VC + GHRSSST
- Membership
- Constellation
- Objectives and activities with GHRSSST
- Benefits
- Friday Meeting



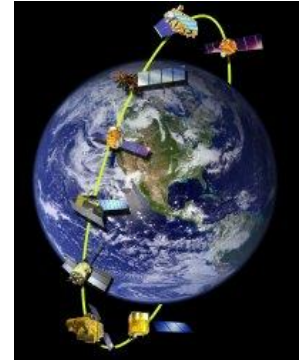
What is CEOS ?



- Committee on Earth Observation Satellites (CEOS) was **established in 1984**
- **CEOS coordinates civil space-borne Earth Observations (EO)** and participating agencies strive to address critical scientific questions and to plan satellite missions without unnecessary overlap.
- CEOS has **three primary objectives** in pursuing this goal:

High-level, all-EO focus, long-term view, decision maker membership, (resources, satellites, programmes...), “Top Down” approach...

Connecting to EO applications and users through the concept of Virtual Constellations





The First Iron bridge in the world, Shropshire, United Kingdom,
Built by Abraham Darby, 1781

The aim of the CEOS SST-VC is:

Development and improvement of SST products including the ECV. SST seeks to develop and implement metrics for SST services, products and users, to improve calibration and validation of the relevant instruments, and to develop training activities for satellite SST practitioners. SST serves as the formal link between CEOS and GHRSSST). Information from the SST Constellation primarily benefits the SBAs of climate, weather and water.



THE CEOS SST-VC MEMBERSHIP 2013

Kenneth S Casey	NOAA, USA
Craig J Donlon	European Space Agency, The Netherlands
Misako Kachi	Japan Aerospace Exploration Agency (JAXA), Japan
Andrew Bingham	NASA
Hans Bonekamp	EUMETSAT
Chris Merchant	UKSA
Helen Beggs	CSIRO/BoM
Jane Olwoch	SANSA
G. Corlett	WGCV representative and GHRSSST Project Office
TBD	ISRO
TBD	CONAE
TBD	NRSCC
TBD	NSMC/CMA
TBD	Roskosmos
TBD	KARI

Carolyn Richter	GCOS
TBD	GOOS
P.J Minnett	GHRSSST Science Team Chair (ex officio)



UK Space Agency: Chris Merchant

The background of the slide is a composite image of Earth and the Moon from space. The Earth's horizon is visible on the left, with a bright blue glow from the sun. The Moon is on the right, showing its craters. The sky is dark with stars.

Jane M Olwoch SANSA Earth Observation

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By Matt McGrath
Environment correspondent, BBC News



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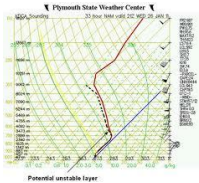
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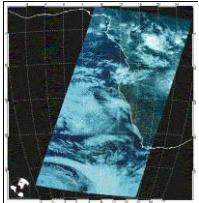
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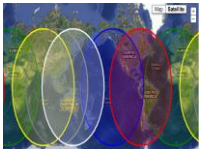
Ocean in situ SST system



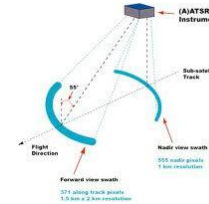
Atmospheric parameters (satellite, model and in situ)



2 wide-swath high polar orbit Infra red imagers (1km, <0.3K)



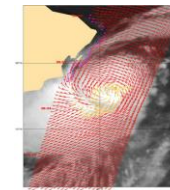
Global constellation of geostationary infrared imagers (1-3 km, <0.3K)



Dual view polar orbit infrared high fidelity SST reference sensor

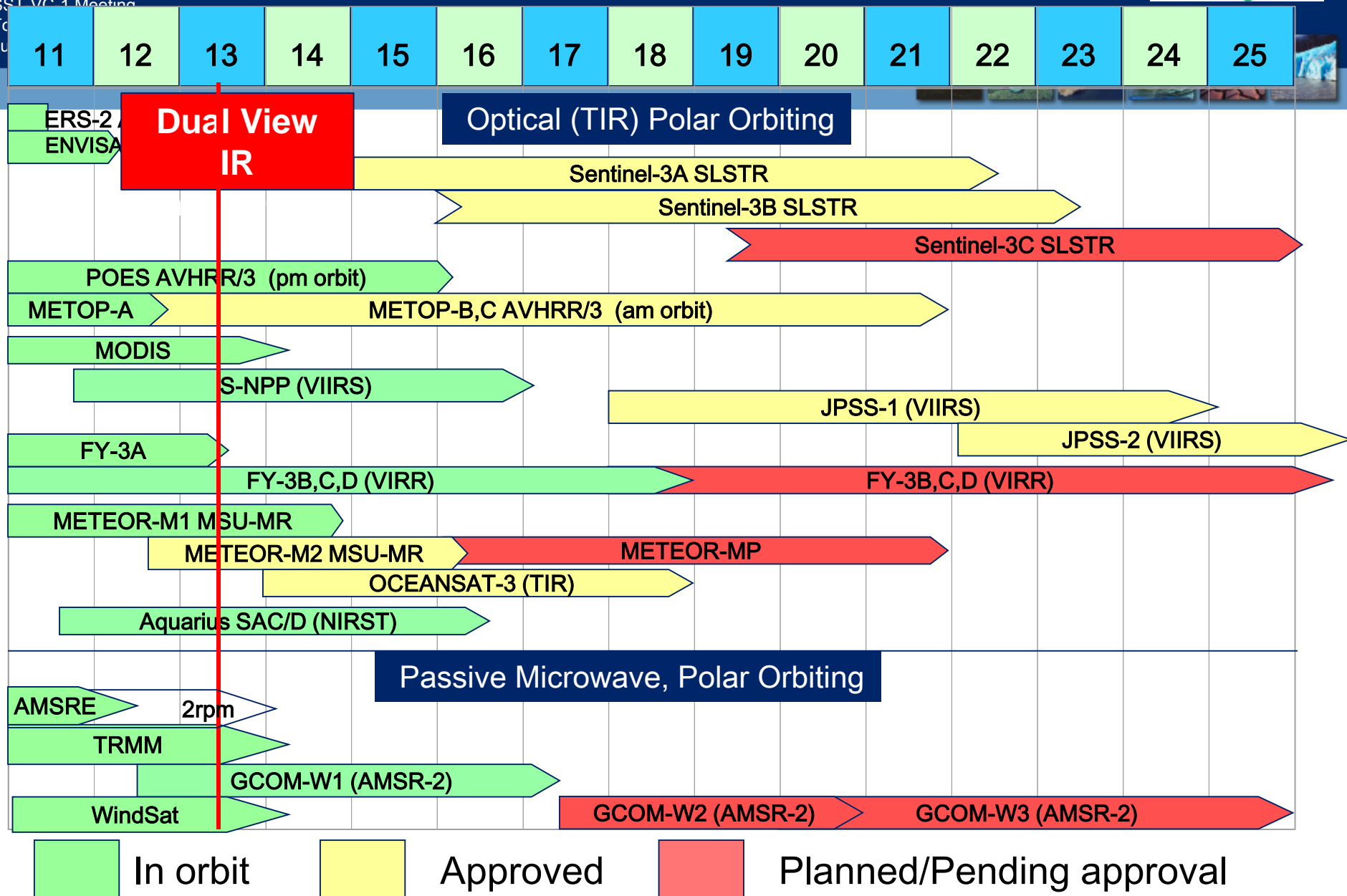


Wide swath polar orbit passive microwave imager



Wide swath ocean surface vector winds (<25 km, <0.2m/s)

Donlon, et al, (2010). "Successes and Challenges for the Modern Sea Surface Temperature Observing System" in *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison, D.E. & Stammer, D., Eds., ESA Publication WPP-306, doi:10.5270/OceanObs09.cwp.24





O.S.C.A.R.

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Variable: Sea surface temperature ◀ ▶

Definition

Full name	Sea surface temperature		
Definition	Temperature of the sea water at surface. The "bulk" temperature refers to the depth of typically 2 m, the "skin" temperature refers to within the upper 1 mm.		
Measuring Units	K	Uncertainty Units	K
Horizontal Res Units	km	Vertical Res Units	N/A
Comment:	Detailed SST definitions are available from GHR SST: https://www.ghrsst.org/ghrsst-science/sst-definitions/		
Last modified:	2011-06-15		

Classification

Domain: Ocean	Used in Application Areas:
Theme: Ocean and sea ice	CLIC
Variable: Sea surface temperature	Climate-AOPC
Measured in Layers:	CLIVAR
Surf-sea	Climate Modelling Research
Bulk	Global NWP
Coast	Climate - GOOS
Open oc	Ocean surface - GOOS
	High Res NWP
	Marine biology
	Nowcasting
	Ocean Applications
	Climate-OOPC
	SIA
	Synoptic Meteorology

Requirements defined for Sea surface temperature (20)

This tables shows all known Requirements defined for this variable area. For more operations/export, please go to the main [Requirements page](#)

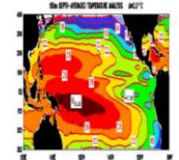
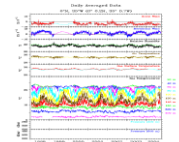
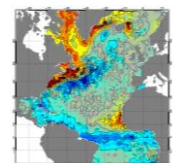
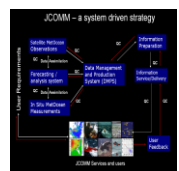
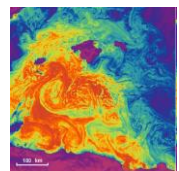
Note: In reading the values, goal is marked **blue**, breakthrough **green** and threshold **orange**

Id	Layer	Application Area	Uncertainty	Horizontal Resolution	Vertical Resolution	Observing Cycle	Timeliness	Conf Level	Val Date	Source	Comment
106	Surf-sea	Climate-AOPC	0.25 K 0.4 K 1 K	10 km 50 km 500 km		3 h 6 h 24 h	3 h 6 h 12 h	firm	2007-07-19	AOPC	Bulk. Signal size supports this need. See P.D. Jones et al. 1999. Surface air temperature and its changes over the past 150 years. Rev. Geophys., in press.
201	Surf-sea	CLIVAR	0.1 K	10 km		3 h	24 h	reasonable	1998-	WCRP	

SST-VC Objectives



- **Foster better engagement by Nations operating or preparing satellite SST sensors** within the SST-VC and GHRSSST frameworks,
- **Maintain a strong and mutually supportive relationship with the GHRSSST,**
- Provide an **interface to CEOS for GHRSSST** activities.
- **Improve coordination, consolidation and development** of the collective SST capability,
- Work to **assure long-term continuity of passive microwave SST data,**
- **Develop the driving requirements to create, validate and sustain the development of an international ensemble of ECV SST** measurements from space,
- **Support outreach, education and development of new SST practitioners,**
- Foster **better use of reference sensors** (i.e. dual view IR) within the Constellation,
- **Provide advice and advocate to the international community** the importance of SST,
- **Enforce standards** (e.g, definitions of SST, collection methods, algorithms, validation approaches, data management, product formats)
- **Advocate and endorse future funding activities**



Activity	Status
1. Minimize duplication of existing activities	Underway through VC establishment
2. Develop and optimize the SST constellation	OceanObs '09 White Paper, ongoing.
3. Develop and implement metrics for SST services, products, and users	User Requirements Document published
4. Coordinate consensus SST reference documents	GHR SST Data Specification 2.0 (GDS2) published. Updates ongoing.
5. Encourage timely access to products	53/60 GHR SST now fully integrated in IDN/CWIC (WGISS)
6. Develop and improve the satellite SST ECV	Working with WGClimate + CDR-TAG
7. Improve SST calibration, inter-calibration, and validation	Ongoing (IR radiometer intercomparison, ISSI work)
8. Improve user feedback to CEOS Agencies	Ongoing
9. Develop training activities for satellite SST practitioners	Gap analysis complete and proposed way forward presented at GHR SST-13
10. Liaise with the other VCs	Underway
11. Prepare VC Implementation Plan for CEOS	Complete March 2012



1. Continue to interface GHRSSST activities with CEOS and enhance cooperation with CEOS Ocean VC's
2. Increase CEOS SST-VC membership (Targets: KARI, NRSCC, NSMC/CMA, ISRO, CONAE, Roskosmos, SANSA)

SST-VC: Space Segment

- Address gap in dual-view TIR imaging since loss of ENVISAT AATSR (AVHRR & IASI)
- Launch of Sentinel-3A in 2015 providing continuity of dual-view IR measurements.
- Commission METOPB AVHRR and NPP
- Inclusions of ISRO OCEANSAT3, KARI COMS, NOAA NPP, JAXA GCOM-W, EUMETSAT METOP&MTG within the SST-VC
- Prepare White Paper on SST Constellation definition (needs, structure, system)

SST-VC: Ground Segment/Information systems

- Data availability and access: Maintain and evolve the user/producer community providing international exchange and application of NRT EO SST data within the GHRSSST framework
- Bring GCOM-W, COMS and VIIRS SST data into the GHRSSST framework
- CEOS-GEO Action IN-03-C1_1: Translate and bring on-line EO-SST data holdings within the CEOS WGISS Integrated Catalogue (CWIC)
- Improve multi-sensor L4 analyses and ensemble products of EO SST for operational and climate applications
- Develop and implement metrics for SST services, products and users.

SST-VC 2015 accomplishments

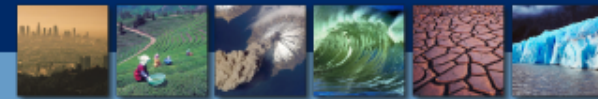


- **SST-VC: Products and services**

- Coordinate user requirements and feedback for SST Products and Services
- Improve SST product validation and coordination of validation teams
- Climate monitoring and research (CEOS-GEO Actions CL-01-C1_1& CL-01-C1_2)
Development of SST CDR as *CEOS Response to the Satellite Supplement of the 2010 GCOS IP* via ESA CCI and GHR SST activities
- CEOS-GEO Action IN-02-C1_3: Implement QA4EO principles into GHR SST SST data sets in the most appropriate manner
- Ocean Supersites Development: pilot using the High Resolution Diagnostic data set (HR-DDS) via the ESA Felyx project (<http://hrdds.ifremer.fr/>) for SST, Ocean Colour, Wind/Wave (CEOS-GEO Action DI-01-C2_2)

- **SST-VC: Notes**

- Capacity building: Develop training activities for satellite SST practitioners.
- Improve user feedback to CEOS Agencies via better integration of existing GHR SST activities within CEOS.



From WGClimate ToR:

- Define and implement a consistent Climate Monitoring Architecture for space-based observations.
- Review and assess, on behalf of CEOS, the generation of Fundamental Climate Data Records (FCDRs) and derived Essential Climate Variable (ECV) climate products supported by Member space agencies,

WGClimate: Space Segment

- Once initial rendition of Physical Architecture is complete, concrete recommendations on climate observation priorities for space segment will be provided.
- Undertaken in collaboration with CGMS, expected within 2015.

WGClimate: Ground Segment/Information systems

- Essential Climate Variable Inventory.
- First version and analysis available by Q1 2014.

WGClimate: Products and services

- Consensus system metrics for assessing ECV maturity end 2014.
- In depth ECV/TCDR assessment procedure and pilots Q2 2014.
- Both undertaken with SST and OCR VCs (and their associated scientific bodies - GHRSSST, IOCCG) and in collaboration with WCRP-DAC.

Note: the joint activity on the climate monitoring architecture with CGMS has been extremely productive and beneficial. If this is to continue in the future then some joint oversight mechanism would be necessary and effective



- Significant variation, even internally, in defining and communicating what the VCs and WGs aim to achieve
- VCs mainly deliver space segment coordination outcomes and

SIT 28-11	SIT Chair Team, in consultation with CEOS SEC, to work with all VCs to agree on an update to their Terms of Reference (TORs) including common elements and informed by a draft template - and to update the VCs Process Paper to ensure application of the new format to all future VCs.	CEOS Plenary
SIT 28-12	SIT Chair Team, in cooperation with the VCs and WGs, to further develop the harmonised statement of 2015 contributions and accomplishments of VCs and WGs (using the updated TORs) – defining scope and value-added of the groups in achieving the deliverables.	CEOS Plenary

the space segment would help communication & management?

VCs and Science Teams



VC	Science Team(s)	VC-ST Interface	Formal Coordination Status
SST	GHRSSST	All SST-VC members are in GHRSSST.	GHRSSST established SST-VC.
OSV W	IOVWST	Paul Chang/NOAA	Dialog initiated at 2012 IOVWST meeting in Utrecht.
OCR	IOCCG <i>CEOS Associate</i>	Mark Dowell/JRC Paula Bontempi/NASA	OCR-VC members frequently presented at IOCCG. Coordination potential on ECV generation in support of GCOS
OST	OST-ST	Pascal Bonnefond/France Joshua Willis NASA JPL	OST-ST is part of the formal 4-party agreement covering up to Jason-3. OST-ST has expressed some desire to expand beyond current 4 parties.

VCs and Science Teams



VC	Science Team(s)	VC-ST Interface	Formal Coordination Status
PC	NASA and JAXA PMM-STs, M-T IST, CGMS-IPWG, GEWEX	NASA, JAXA, U. of Nagoya, CNES, LEGOS- OMP/CNRS, UCAR, CSU	STs have participated PC-VC since its inception in 2007, contributing to the PC-VC IP, work plans and reporting, and CEOS GCOS IP response. PC-VC workshops held on the sidelines of the NASA PMM ST meetings to facilitate participation.
ACC	SPARC, IOC, mission science teams, GCOS, European Carbonsat MAG	Ongoing collaborative efforts with SPARC, IOC and others	
LSI	Land cover mission STs, land- derived ECV groups, GOEC-	Informal	Formative

Mapping Existing Relationships



CEOS Entity	ISWG	Link
OCR-VC	IOCCG	Associate member
WGClimate	WCRP activities	Associate member
SST-VC	GHR SST	Catalyst for VC
OST-VC	OSTST ?	
OSVW-VC	OSVWST?	
PC-VC	Precip. STs	Formative and on going contributions to the VC
ACC-VC	...	
LSI-VC	...	

Benefits of VC's + Science Teams



There are multiple benefits to links between CEOS VCs/WGs and domain specific international science working groups

- They provide the **scientific underpinning** to CEOS agency activities in the international context
- They can provide **independent oversight** on activities where this is required
- They provide a **international consolidation of “scientific user requirements”** for CEOS agency datasets and products



SST-VC Implementation Targets:

1. **Wider participation of CEOS Agencies** in SST related activities
2. Continued **support to an extensive user community** with established and functional systems and services
3. **Stronger CEOS Agency SST activities** through better synergy and communication
4. **Better SST product and service interoperability** building on the strengths of CEOS Agencies
5. **Better data access and product applications** by CEOS Agencies
6. **Value for money to CEOS Agencies** by capitalising on the already committed investments made to GHR SST
7. **Reduce duplication of coordinating activities**



Benefits so far...



- SST-VC is raising the profile of GHRSSST within Agency Management with positive outcomes (e.g. travel, awareness, general support)
- SST-VC linkages across various climate groups is working well (CDF-TAG + WGClimate)
- SST-VC is working well with CEOS Cal/Val working groups
- GHRSSST+SST-VC is well appreciated by CEOS: in fact it is being used as a “model” for other VC’s.
 - Pilot for WG-Climate
- Attracting (slowly) new members within the VC which is helping with GHRSSST activities (e.g. Cape Town in 2014)
- The SST-VC is no longer perceived as a threat by GHRSSST.
- GHRSSST has been able to showcase its forward looking data management maturity by implementing CEOS data management requirements (CWIC) quickly and effectively.



- CDR-TAG has requested SST-VC to alert Space Agencies to the urgent need for long-term preservation of paper documentation for satellite instruments (e.g. characterization, calibration etc)
- GPO has requested assistance from the SST-VC to help set up a “GHRSSST Guardian” scheme to sustainably share the costs of essential GHRSSST infrastructure across Agencies (To be considered)
- SST-VC AND GHRSSST to develop a white paper on the SST Constellation vision for 2025.



Friday 21st June 2013, SST-VC Plenary Session, Room 205, 14:00 – 17:00

1. Welcome from co-chairs and round table introductions of members.
2. Overview of SST-VC progress 2012/13 and status of actions from last meeting (20120606-SST-VC-01-MoM-v1.0-FINAL.docx)
3. Review of updated CEOS SIT Virtual Constellations Process Paper (VC TORs update v0-2.docx and also CEOS Virtual Constellations Process Paper 2013 update v0-1a.docx)
4. Review of Homogenized ToR and deliverables for all CEOS VC's (CEOS-SST-VC-ToR-v1.0.docx and VC-WG SIT-28 session slide deck v1-2.pptx)
5. Review of SST-VC Implementation plan (CEOS-SST-VC-IP-Iss-1-Rev-8-(2013-update-in-progress)-draft.docx) and refinement with respect to new CEOS VC ToR
6. SST-VC: how to survive and thrive in a travel-limited world
7. Engaging new SST-VC members
8. SST-VC Constellation White paper (DonlonCasey-SST-VC-GHRSST13-FINAL.docx)

Thank You

Any questions?



Contacts for further information:

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