CEOS WGClimate Update on ECV Inventory

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From WGClimate ToR

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, complementary with existing entities and roles,

…

Undertake an analysis, of the extent to which the current status of production of satellite climate records meets the GCOS requirements, including an analysis of the consistency of definitions of ECVs

Why do we need a Climate Monitoring Architecture?

Main "needs/usage scenarios" have emerged for a climate monitoring architecture:

- Assist in promotion of a common understanding of the implementation implications of meeting the various space-related climate monitoring requirements (e.g. from GCOS)
- To support an assessment of the degree to which the currently implemented systems meet the requirements (and the generation of an action plan to address identified shortfalls/gaps/duplication)
- To improve our understanding of the end-to-end information flows and dependencies (i.e. from sensing through to decision-making)

Joint activity CEOS, CGMS, WMO

EC – Mark Dowell, Chair
ESA – Pascal Lecomte
EUMETSAT – Joerg Schulz, Robert Husband
JMA – Yoshihiko Tahara
NASA – Richard Eckman (Eric Lindstrom)
NOAA – John Bates, Suzanne Hilding, Chuck Wooldridge, (Mitch Goldberg)
INPE – (Daniel Alejandro Vila)
WMO – Jerome Lafeuille, Barbara Ryan, Tillmann Mohr, Hye Jin Lee

Review Group:

- GCOS
- GEO
- WCRP

Strategy Report on a Climate Monitoring Architecture

European Commission

1. Executive Summary and recommendations
2. Introduction, Objectives & Targets
3. Climate Monitoring Principles, Requirements & Guidelines
4. State of the Art
5. Beyond research to operations
6. Climate Architecture definition
7. Mechanisms for Interaction
8. Roadmap for way forward
9. Recommendations

This strategy document is also seen as a foundations for the GFCS Monitoring and Observation Pillar

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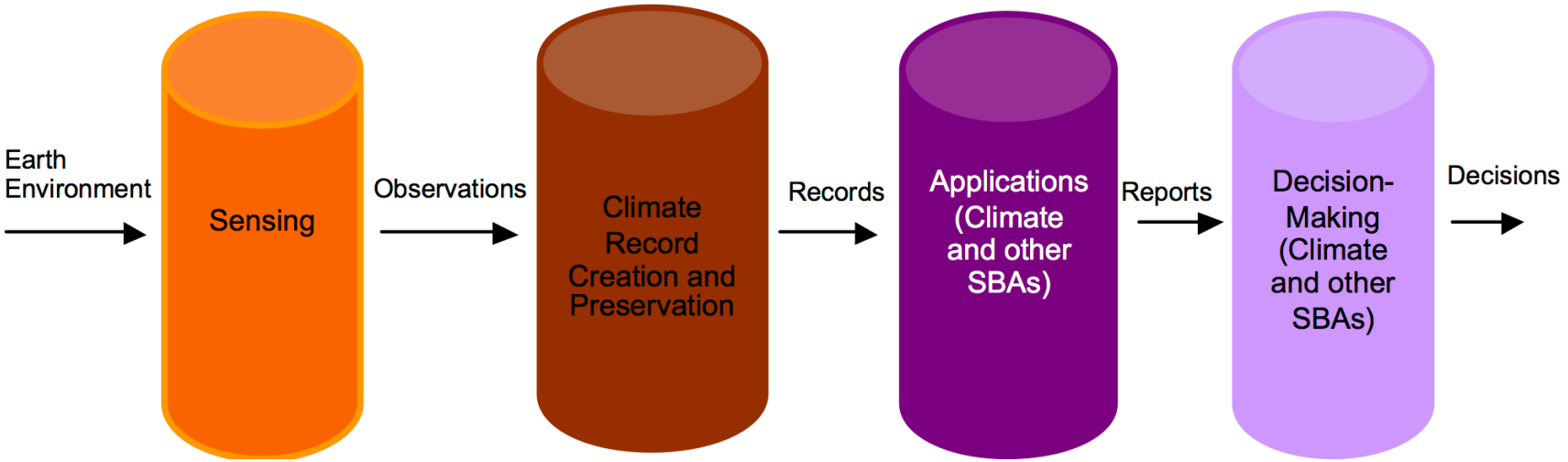
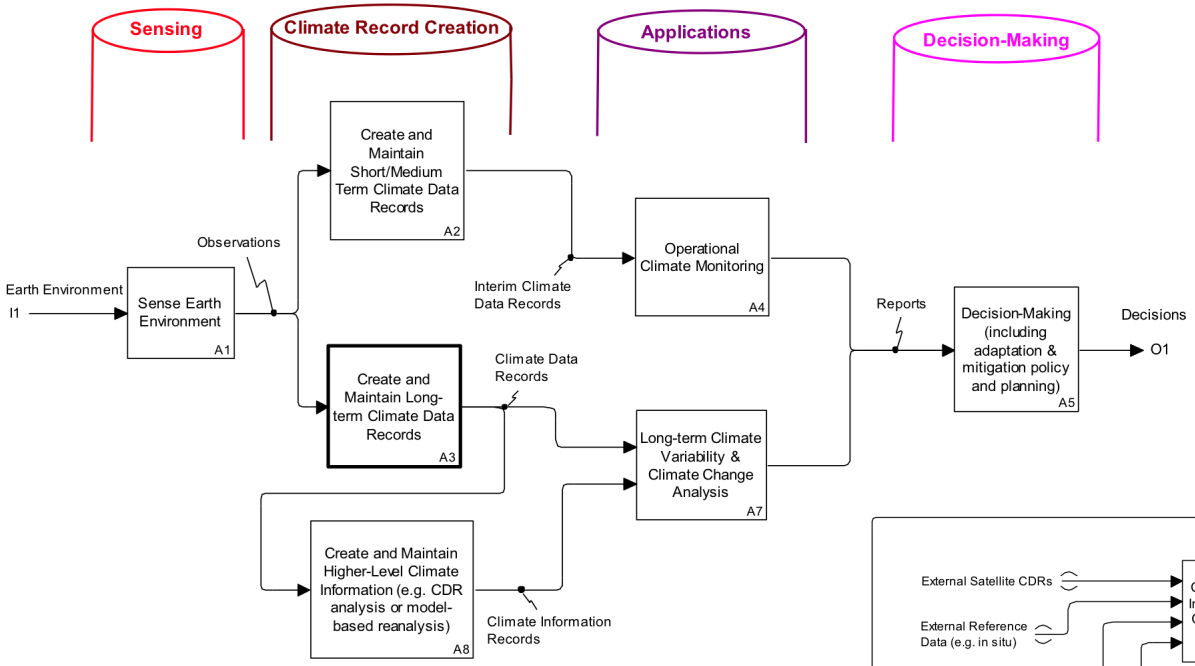
Architecture Pillars

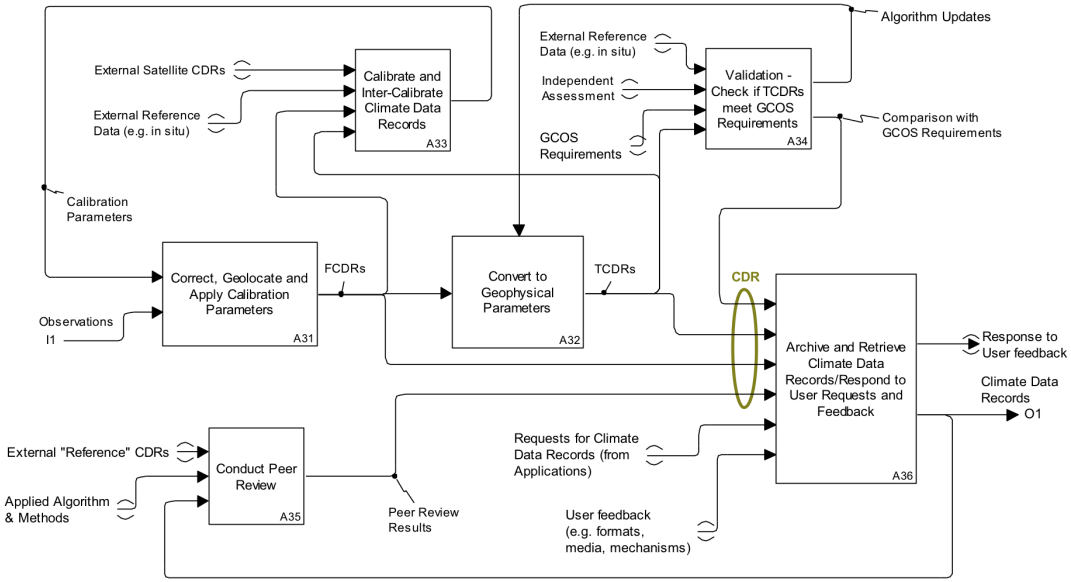


Logical representation



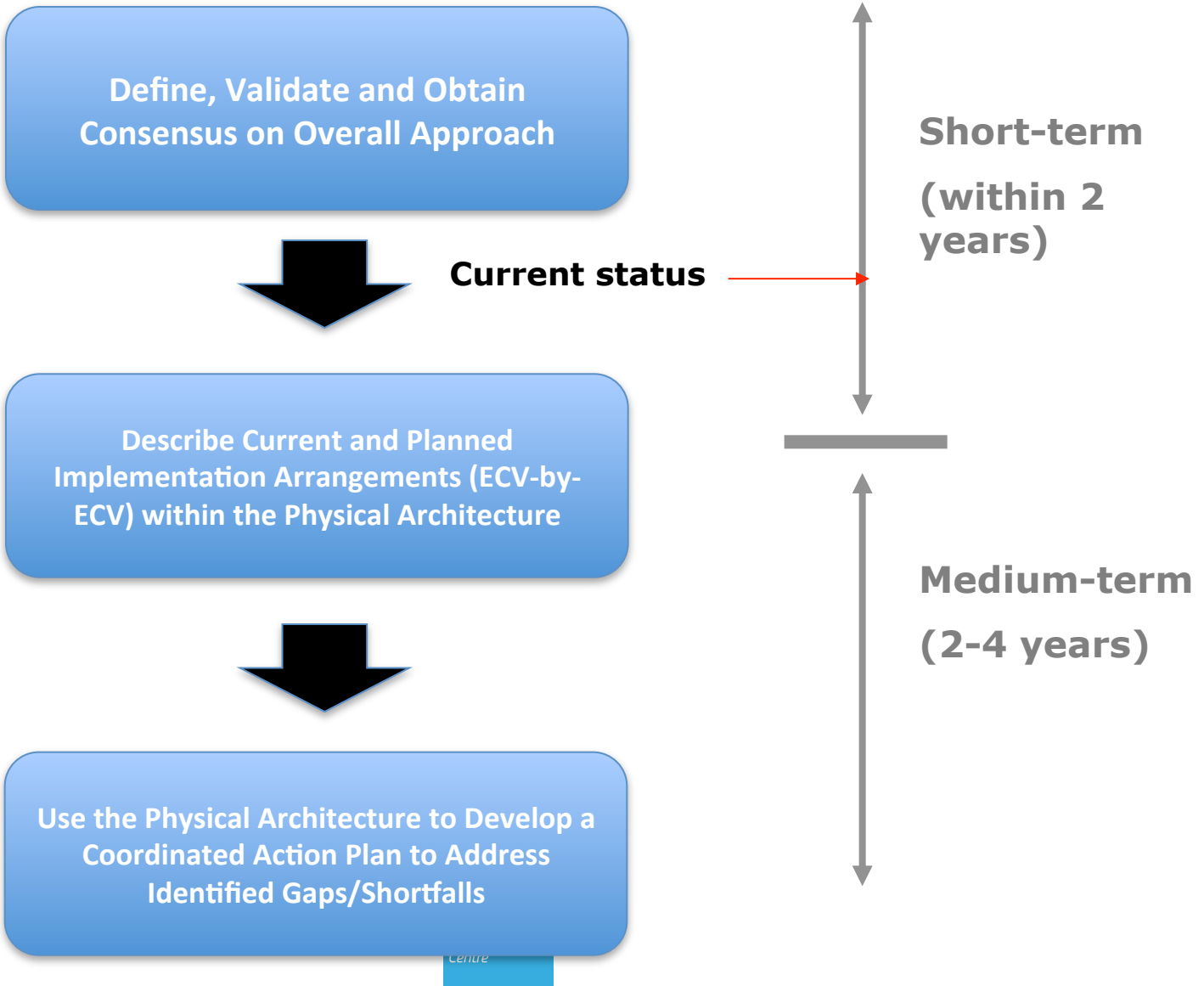
Traceable to GCOS Guidelines and GCOS Climate Monitoring Principles

Traceable from ECV Inventory and physical representation of Climate Monitoring Architecture



Recursive Process - Re-processing Synchronised with Reanalysis (where appropriate)

Way Forward


Define, Validate and Obtain Consensus on Overall Approach
Current status
Describe Current and Planned Implementation Arrangements (ECV-by-ECV) within the Physical Architecture
Use the Physical Architecture to Develop a Coordinated Action Plan to Address Identified Gaps/Shortfalls
Short-term (within 2 years)
Medium-term (2-4 years)

ECV Inventory Questionnaire

- Joint activity CEOS, CGMS and WMO
- Call released with CEOS MIM in May 2012, responses were due October 5th – extended to January 2013
- Questionnaire form – through a web interface.
- 45 total questions based on 5 topics (General, Usage, Stewardship, Properties, Access).
- Many questions use menu selections (12 menus). Some example menus are: Agency, Project, ECV, Satellite, Data Format.
- Responses were requested at the dataset level
- Addresses both existing/past missions and future/ planned mission in two separate questionnaires
- Each single entry takes on average 25 minutes to complete

ECV Inventory – http://www.ecvinventory.com

European Commission

CEOS Essential Climate Variable (ECV) Inventory

WMO CGMS

Home | View ECV Records | Editor LOGIN | Administrator LOGIN

Search Category: Show All

ECV Record Id	CDR_ECV04_7
Responder name	Rainer Hollmann
Responder email	rainer.hollmann@dwd.de
Data Set Identifier	Yes, new release of CM SAF (CM-05)
Responsible organization	EUMETSAT
International Coordination	yes SCOPE-CM
Assessment body	no
Quality control organization	no
Climate applications	cloud feedback, radiation budget
Essential Climate Variable (ECV)	Cloud amount
Collection organization	NOAA *EUMETSAT*
Calibration organization	NOAA
Intercalibration organization	NOAA
FCDR organization	NOAA
TCDR organization	EUMETSAT *CM SAF (DWD, KNMI, SMHI)*
GCOS Requirements Assessments organization	EUMETSAT *CM SAF*
Independent peer review organization	EUMETSAT *Secretariat*

ECV Records

Atmosphere

- CDR_ECV01_10
- CDR_ECV01_11
- CDR_ECV01_12
- CDR_ECV01_13
- CDR_ECV01_14
- CDR_ECV01_15
- CDR_ECV01_16
- CDR_ECV01_17
- CDR_ECV01_18
- CDR_ECV01_19
- CDR_ECV01_20
- CDR_ECV01_21
- CDR_ECV01_3
- CDR_ECV01_4
- CDR_ECV01_5
- CDR_ECV01_6
- CDR_ECV01_7
- CDR_ECV01_8
- CDR_ECV01_9
- CDR_ECV02_1
- CDR_ECV02_2
- CDR_ECV02_3
- CDR_ECV02_4

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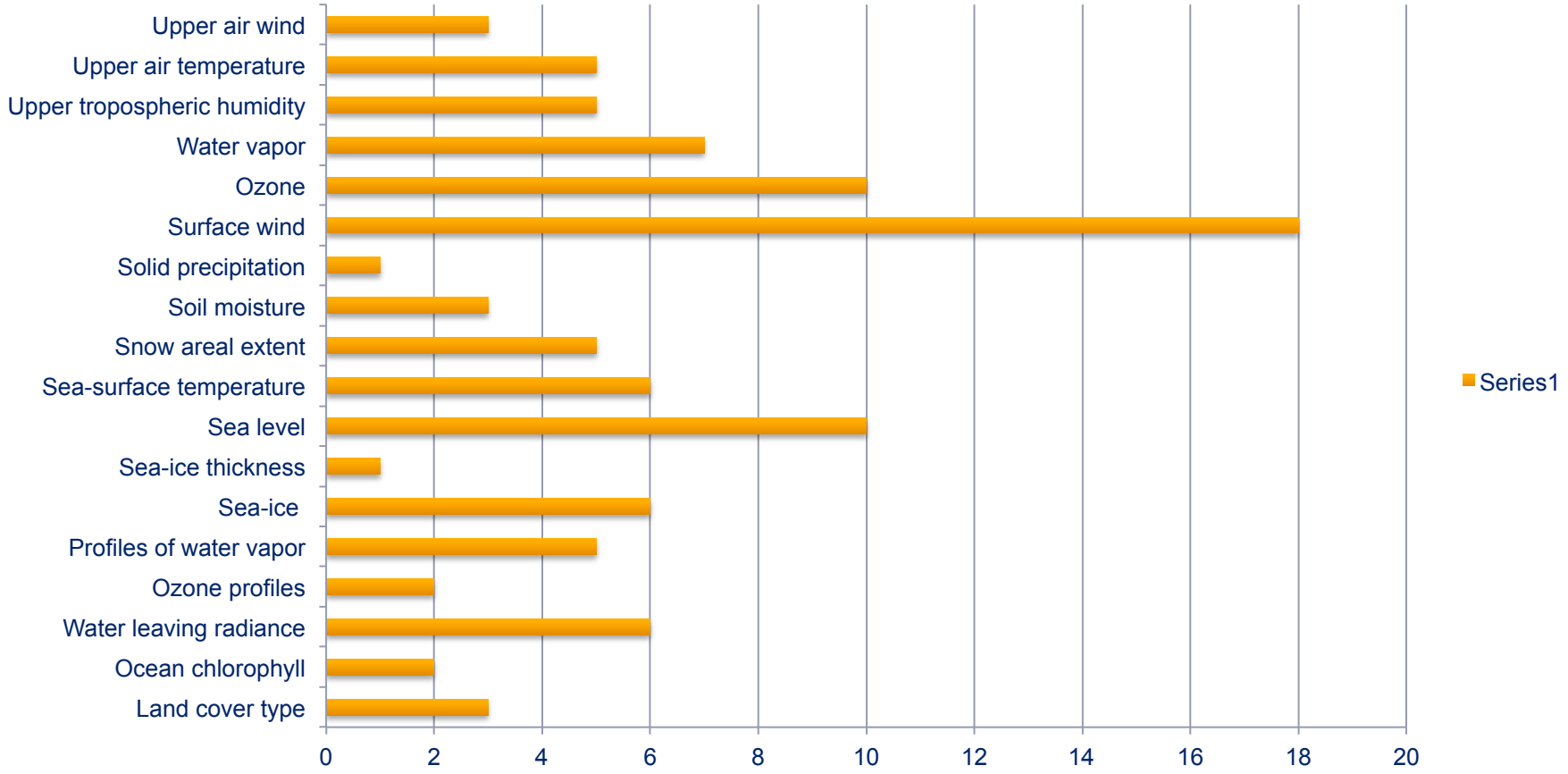
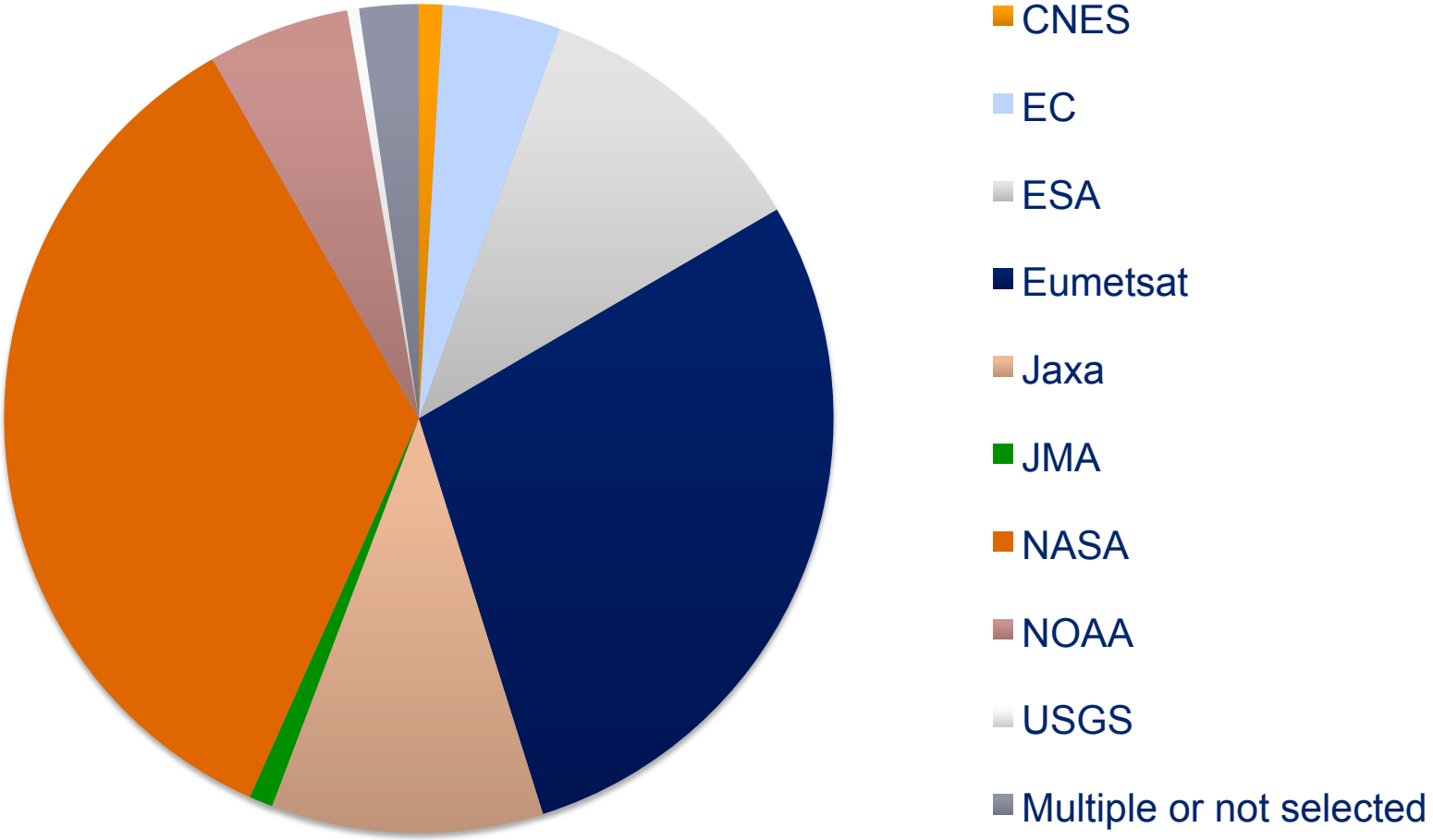
ECV Inventory Statistics

- Number of records per ECV, continued



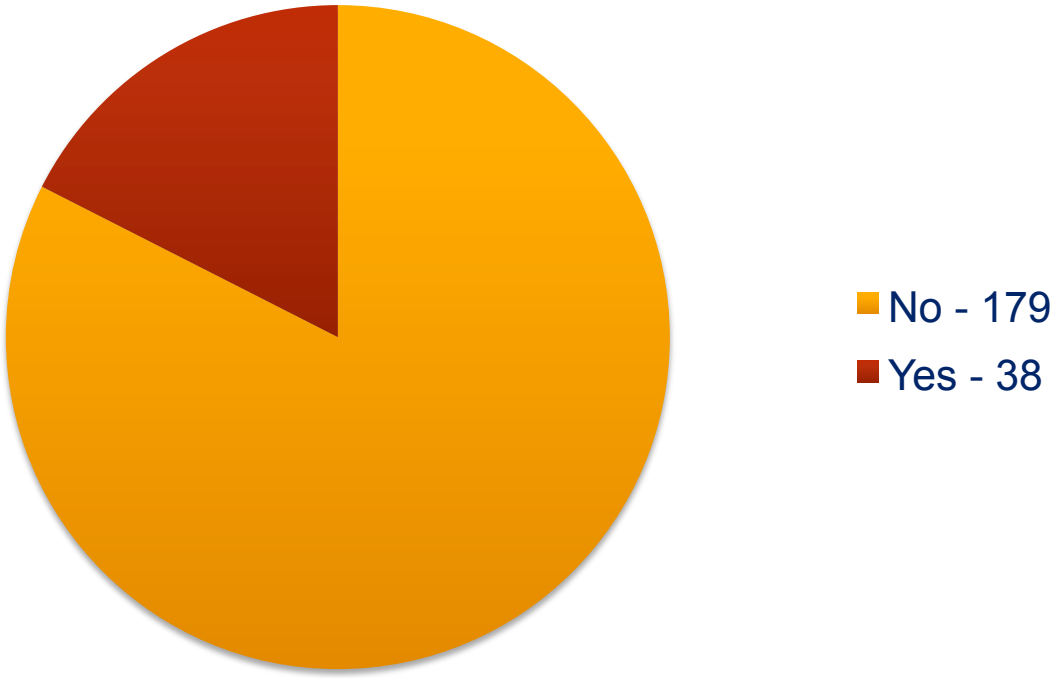
ECV Inventory Statistics – Responsible Org

- Number of records per responsible organization



ECV Inventory Statistics – In-situ Cal Network

- Number of records that use an in-situ network for cal/val



ECV Inventory Statistics – ECV Timelines

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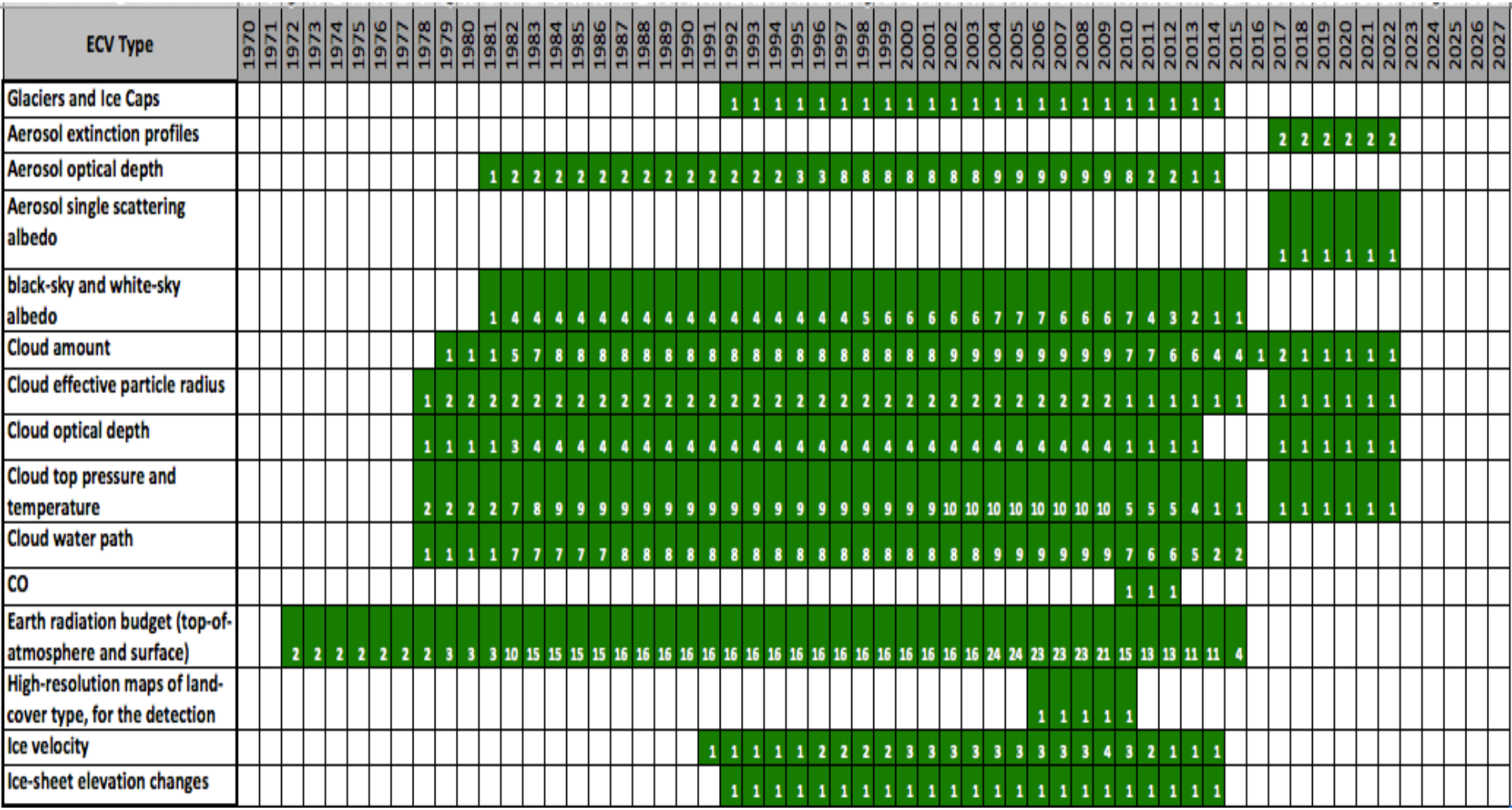
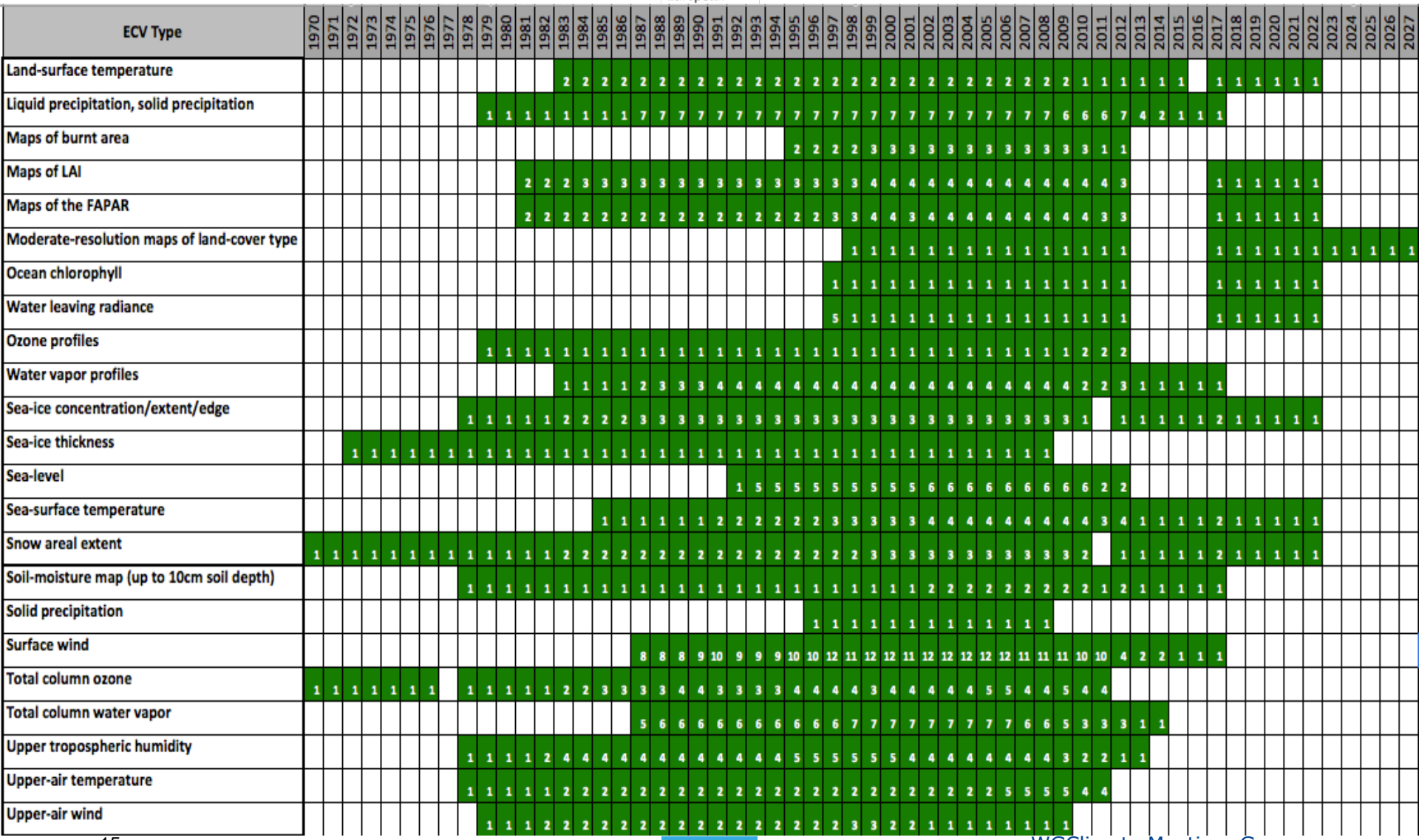


ECV Type	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Glaciers and Ice Caps																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																
Aerosol extinction profiles																																															2	2	2	2	2	2						
Aerosol optical depth												1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	8	8	8	8	8	8	8	8	9	9	9	9	9	9	8	2	2	1	1														
Aerosol single scattering albedo																																															1	1	1	1	1	1						
black-sky and white-sky albedo												1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	6	6	6	6	6	7	7	7	6	6	6	7	4	3	2	1	1														
Cloud amount										1	1	1	5	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	7	7	6	6	4	4	1	2	1	1	1	1	1						
Cloud effective particle radius									1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1		1	1	1	1	1	1						
Cloud optical depth									1	1	1	1	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	1	1				1	1	1	1	1	1						
Cloud top pressure and temperature									2	2	2	2	7	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	10	10	10	10	10	10	5	5	5	4	1	1		1	1	1	1	1	1						
Cloud water path									1	1	1	1	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	7	6	6	5	2	2													
CO																																										1	1	1																		
Earth radiation budget (top-of-atmosphere and surface)			2	2	2	2	2	2	2	3	3	3	10	15	15	15	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	24	24	23	23	23	21	15	13	13	11	11	4											
High-resolution maps of land-cover type, for the detection																																										1	1	1	1	1																		
Ice velocity																						1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	4	3	2	1	1	1																	
Ice-sheet elevation changes																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																	

ECV Inventory Statistics – ECV Timelines



ECV Type	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Land-surface temperature														2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1		1	1	1	1	1	1					
Liquid precipitation, solid precipitation										1	1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	7	4	2	1	1	1									
Maps of burnt area																										2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1																		
Maps of LAI												2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	3				1	1	1	1	1	1					
Maps of the FAPAR												2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	3	4	4	4	4	4	4	4	4	3	3				1	1	1	1	1	1					
Moderate-resolution maps of land-cover type																												1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1
Ocean chlorophyll																												1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1					
Water leaving radiance																												5	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1					
Ozone profiles										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2														
Water vapor profiles														1	1	1	1	2	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2	3	1	1	1	1	1							
Sea-ice concentration/extent/edge									1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1		1	1	1	1	1	2	1	1	1	1	1					
Sea-ice thickness			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1														
Sea-level																							1	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	2	2														
Sea-surface temperature																	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3	4	1	1	1	1	2	1	1	1	1	1					
Snow areal extent	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	2		1	1	1	1	1	2	1	1	1	1	1					
Soil-moisture map (up to 10cm soil depth)										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1									
Solid precipitation																											1	1	1	1	1	1	1	1	1	1	1	1	1	1																		
Surface wind																		8	8	8	9	10	9	9	9	10	10	12	11	12	12	11	12	12	12	12	12	11	11	11	10	10	4	2	2	1	1	1								
Total column ozone	1	1	1	1	1	1	1		1	1	1	1	1	2	2	3	3	3	3	4	4	3	3	3	3	4	4	4	4	3	4	4	4	4	4	5	5	4	4	5	4	4															
Total column water vapor																		5	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	6	6	5	3	3	3	1	1													
Upper tropospheric humidity										1	1	1	1	2	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	4	4	4	4	4	4	4	4	3	2	2	1	1												
Upper-air temperature										1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	5	5	5	4	4														
Upper-air wind											1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	1	1	1	1	1	1	1																		

ECV Inventory response received so far

- ~220 entries so far good representation across domains
- Much more response on past/current than on planned/future
- Potential for gap analysis to distinguish what is being observed but not used
- Initial quality control underway assessing completeness, consistency checks (incl. with MIM), domain experts broad overview

ECV Inventory data analysis - ideas

- Spatial temporal resolution vs. GCOS requirements check - - **justify our existence**
- Comparative gap analysis for ECV products and sensors - **missed opportunities**
- Histograms comparison of length of ECV timeseries for "operational" and "research" agencies - **myth buster**
- Shared responsibilities pre-launch cal, post-launch cal, validation – **stewardship**
- Cluster climate application field on GFCS Priorities & WCRP grand challenges - **justify our existence**

Joint
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ECV Inventory data analysis - ideas contd.

- Identify number of agencies per ECV, comparison existing VCs – **missed opportunities**
- Number of citations of product references provided - **stewardship**
- Coverage analysis global vs. regional – **match making**
- Combining polar and geostationary missions: possible examples SST, precipitation, clouds, LST, albedo – **missed opportunities**
- Take two ECV products COVE analysis for intercalibration – **match making**

Links to WCRP/GCOS inventory initiatives

There is an opportunity to consider a central "database" of ECV product metadata

CEOS-CGMS-WMO maybe the the best "resourced" opportunity for this – **BUT** this should not negate the potential for multiple interfaces to this database

CEOS-CGMS-WMO Inventory needs to:

- Verify consistency of GCOS/WCRP questionnaire with ECV Inventory
- Evaluate feasibility of extending to in-situ data – This would then have to be vetted by CEOS and CGMS plenaries
- On in-situ ultimately CEOS-CGMS-WMO could provide the infrastructure/database but GCOS/WCRP Panels & WMO would be responsible for soliciting insitu contributions (i.e. handholding)