ESA Climate Change Initiative

Lessons from the first 5 years

NOAA CDR Annual Meeting
Asheville
August 5th, 2015

ESA Climate Change Initiative

- **The Context**
- **Objectives of the CCI**
- **Its Implementation**
- **Lessons Learned**
- **The way forward – CCI Programme Extension.**

Two climate action paths

GCOS GLOBAL CLIMATE OBSERVING SYSTEM

WMO of UNESCO UNEP ICSU

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

THE SECOND REPORT ON THE ADEQUACY OF THE GLOBAL OBSERVING SYSTEMS FOR CLIMATE IN SUPPORT OF THE UNFCCC

EXECUTIVE SUMMARY

April 2003

GCOS – 82 (ES)

(WMO/TD No. 1143)

UNITED NATIONS ENVIRONMENT PROGRAMME

INTERNATIONAL COUNCIL FOR SCIENCE

UNESCO UNEP ICSU

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

FOR THE
FOR CLIMATE
NFCCC

INTERNATIONAL COUNCIL FOR SCIENCE

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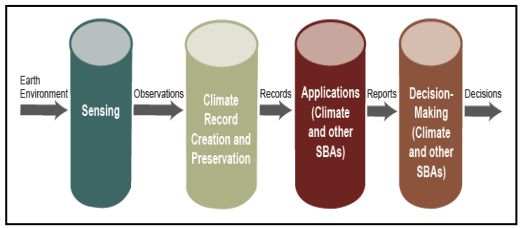
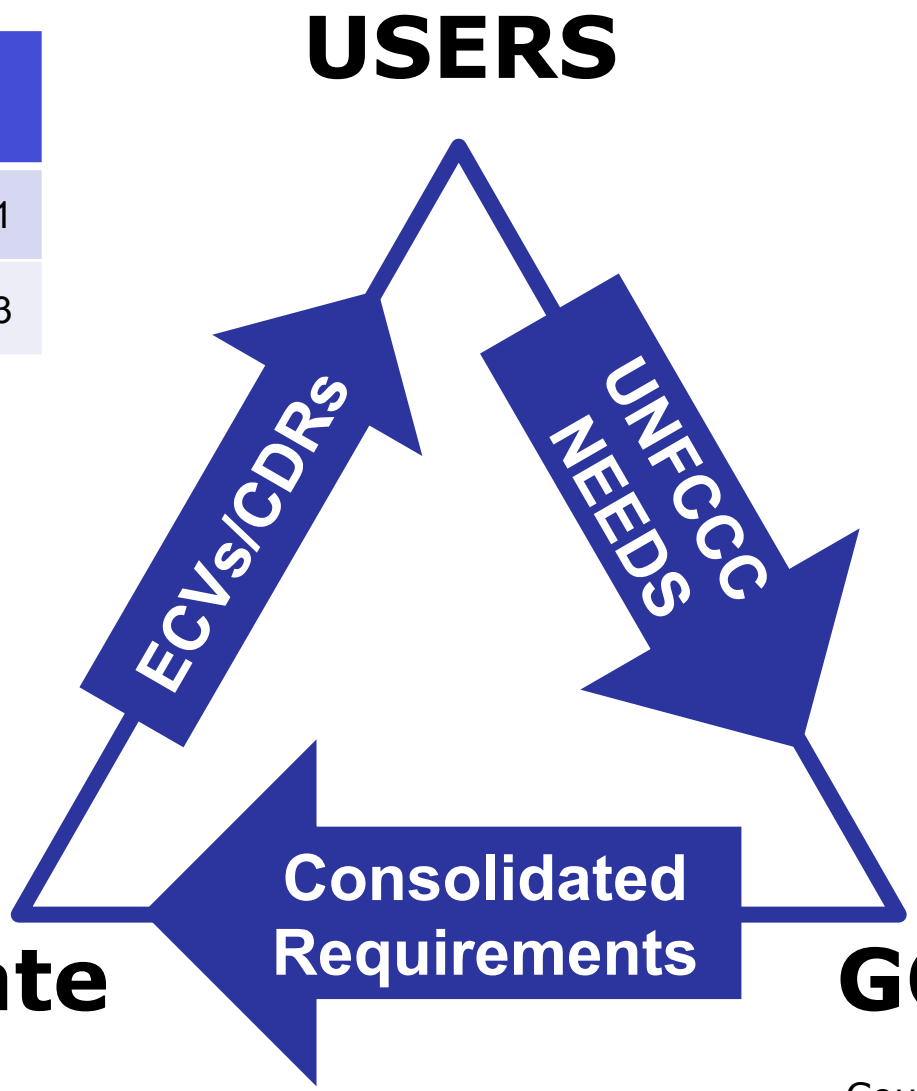
tion Plan (IP)

Convention on
l Advice (SBSTA)
legation

Flow of Requirements to Products

ECV	Carbon Cycle	Water Cycle
Precipitation	Priority 2	Priority 1
CO2	Priority 1	Priority 3





Courtesy J. Bates

Objectives of the CCI

Realise the full potential of the long-term global EO archives that ESA, together with its Member states, has established over the last thirty years …

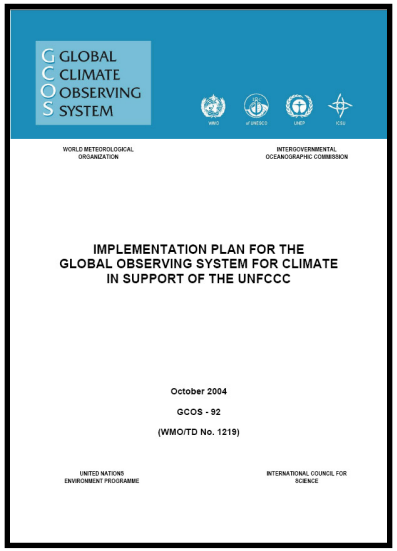
… as a significant and timely contribution to the ECV databases required by the United Nations Framework Convention on Climate Change

CCI Objectives

- **Respond to GCOS Requirements for UNFCCC**
- **Puts European scientists at the forefront of generating Satellite based Climate records.**
- **Strengthen European Research Communities presence in IPCC Assessments**
- **Take benefit of the 30 years investment of ESA Member States in EO Global Observations**

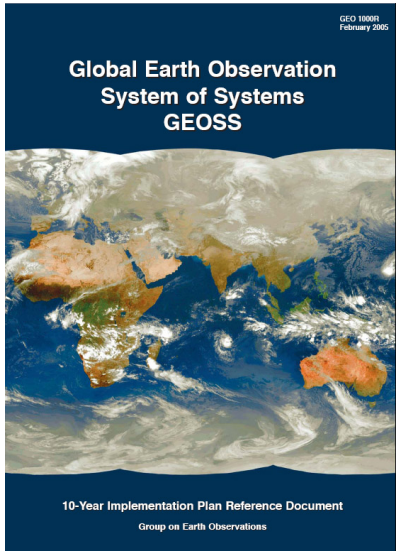
The CCI Implementation

GCOS IP 2004

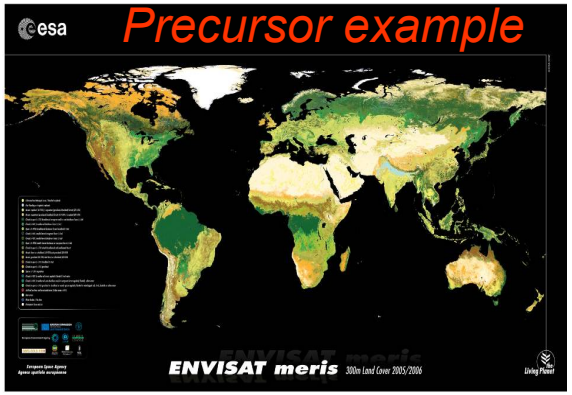


Part of GEO task CL-06-01

GEOSS IP 2005



ESA CCI: Production of Essential Climate Variables (ECV) according to GCOS requirements



ESA Ministerial Council, Nov 2008:
Approval of 75.5 M€ for a six year programme that will contribute to about twenty satellite-based ECVs. A strong interaction with the scientific community is an essential part of the programme. (Funding since increased to 95 MEuro)

The CCI initiative will ensure that ESA can play a full role in deriving relevant ECVs specified by GCOS, based on ESA current and archived EO data. ESA will work with CEOS agencies to ensure as complete a coverage of the entire suite of ECVs as possible.

Within the scope of the CCI as presented in 2009

Atmosphere	Ocean	Terrestrial
Composition	**Surface**	
Aerosols Properties	Sea Surface Temperature	Land Cover
Carbon Dioxide & Methane	Sea Level	Fire Disturbance
Ozone	Sea Ice	Soil Moisture
Long-Lived GHGs	Ocean Color	Glacier and Ice Caps
Precursors (for Aerosols and O3)	Sea State	Ice Sheets
Upper Air	Current	Snow Cover
Cloud Properties	Sea Surface Salinity	Albedo
Temperature	Carbon Dioxide Partial Pressure	Leaf Area Index (LAI)
Water Vapor	Phytoplankton	(FAPAR)
Wind Speed and Direction	Ocean Acidity	Lakes
Earth Radiation Budget	**Sub Surface**	Above Ground Biomass
Surface	Carbon	Permafrost
Surface Air Pressure	Current	Ground Water
Surface Air Temperature	Nutrients	River Discharge
Surface Precipitation	Ocean Acidity	Soil Carbon
Surface Radiation Budget	Oxygen	
Water Vapour (Surface humidity)	Salinity	
Near-Surface Wind Speed, Dir	Temperature	
	Tracers	
	Global Ocean Heat Content	

CCI Scope	

Implemented by the CCI

esa

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CCI Scope	Started in CCI	

CCI Master Schedule

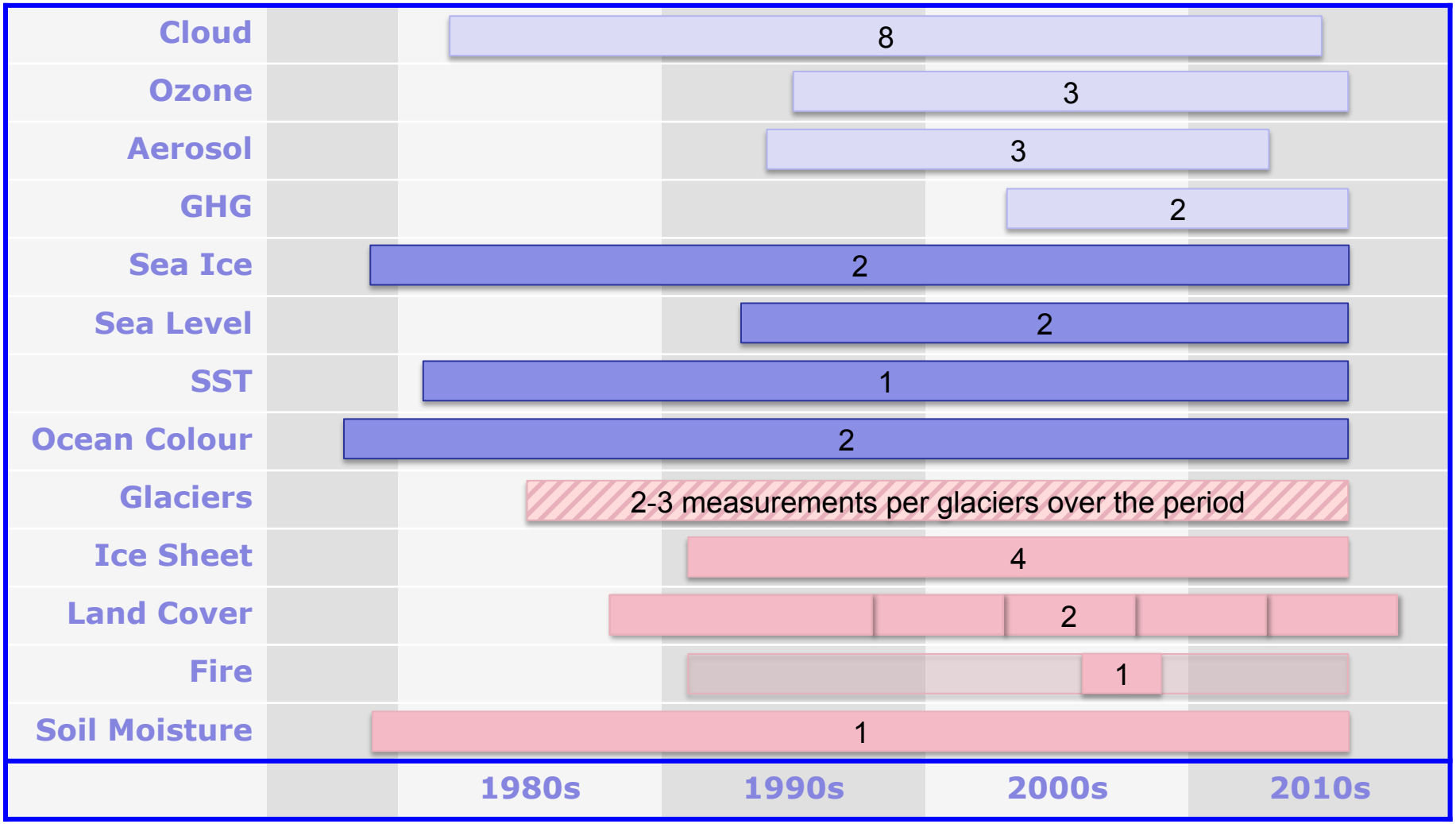
Implementation

- **18 projects**
  - 14 ECV projects
  - 4 cross cutting projects
    - *Climate Modeller User Group, Visualisation, Open Data Portal and Tool Box*
- **90 companies and laboratories**
- **200 European Scientists**
- **CCI Element of the Living Planet Fellowship**
  - 9 grants for post graduates residing in their own institute
  - 1 post-graduate position residing in the ESA Climate Office

Achievements

- **Creation of a European EO Climate Science community**
- **Facilitate the scientific cooperation between the Climate Observing and Modelling Communities**
- **Develop a protocol for Climate Quality Algorithms Evaluation in an international context.**
- **Delivered fully Error Characterised Climate Data sets, first for many ECVs**
- **Provided up to date validated scientific data sets to support International Climate Policy and decision making.**

CCI Products Time Coverage Phase 2



Further Achievements

- **Generate peer reviewed publications in high impact scientific journals by European Scientific Community (>215 publications)**
- **Pave the way for the ECV component of the Copernicus Climate Change Services,**
- **Facilitate the Sea Level Closure Budget by strengthen dialogue between Glaciers, Ice Sheets and Sea Level research communities,**

C3S and CCI

- **Coordination with C3S (EC/ECMWF)**

  - C3S Mission
    - *Authoritative source of climate information for Europe covering past climate and trends, current state of the climate and projections of possible scenarios of future climate.*
    - *Building upon national and international existing efforts*
    - *Supporting the market for climate services in Europe*

  - Continuous exchanges between ESA, ECMWF and the EC on CCI-C3S interactions and complementarity

  - ECMWF organises workshops with stake holders, data providers, potential users …
    - *Active participation from ESA*

C3S= Copernicus Climate Change Service

Lessons Learned

- **Independent source of requirements (GCOS)**
  - Re assessed with a strong used consultation
- **Strong Science Connections**
  - The Science Leader is the Prime contractor
  - Strong links with the International Community
  - Peer reviewed Publications contractually mandatory
- **Strong links with the Climate user community**
  - A specific activity – Climate Modeller User Group (CMUG)
  - Each project has a Climate Research Group
- **A 360º review of existing algorithms**
  - Round Robin Exercise to select the best algorithms
- **Multiple Reprocessing to**
  - Use most up to date algorithms

Toward a programme extension

- **Maintain European contribution to the CEOS coordinated response to GCOS,**
- **Involve the European Science Community in the development of new ECVs,**
- **Further enhance European Research Communities presence in IPCC Assessments,**
- **Capitalise on new Research Missions to Global Climate Records.**

Programme Extension CCI +

- **In the current context (role of ESA, of EUMETSAT and of Services developed by EC)**
  - The role of ESA is to focus on Research and Development
- **The main strategic line consist in:**
  - Propose new ECV.
  - Propose projects using many ECVs.
- **Take into account CSAB recommendations**
- **Take into account requests from delegations**

Implemented by the CCI

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CCI Scope	Started in CCI	

Proposed within CCI Extension

Atmosphere	Ocean	Terrestrial
Composition	**Surface**	
Aerosols Properties	Sea Surface Temperature	Land Cover - High Resolution
Carbon Dioxide & Methane	Sea Level	Fire Disturbance
Ozone	Sea Ice	Soil Moisture
Long-Lived GHGs	Ocean Color	Glacier and Ice Caps
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CCI Scope	Implemented in CCI	Proposed in CCI Extension

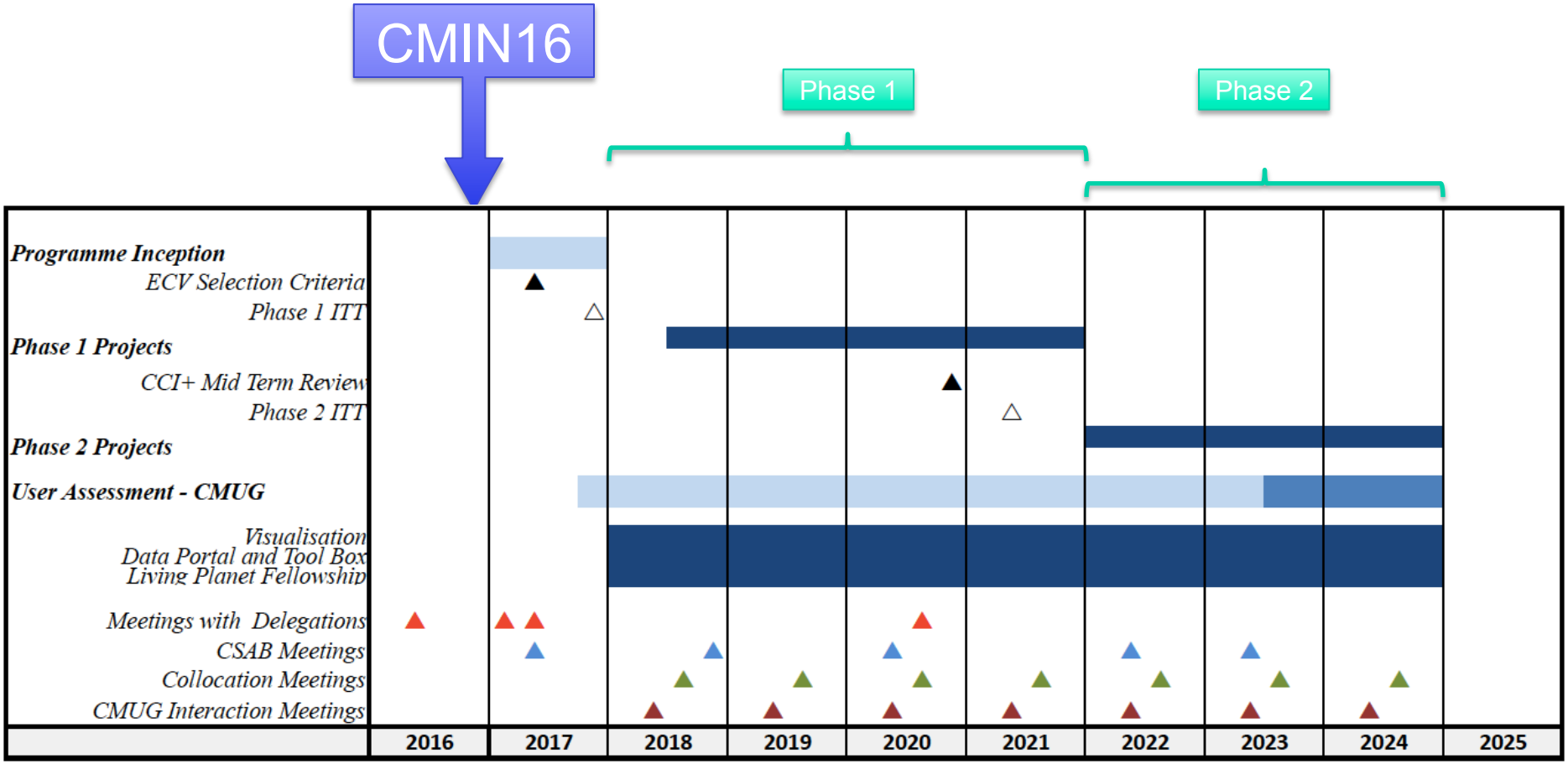
Other potentially valuable activities

- **Extra products from existing CCI ECVs, e.g.:**
  - Sea ice drift
  - Cloud heights from O2A and O2-O2 band
  - Aerosol absorption properties
  - Ocean colour in highly-productive coastal Case-2
  - Improved accuracies and improved error estimation

- **Adaptation of CCI processing chains to new Sentinel data**
  - New instrument capabilities
    e.g. new spectral bands, higher resolution, different observing geometry
  - Time series consistency between different instruments
    e.g. ATSR-1, ATSR-2, AATSR, SLSTR

- **Cross-ECV Exploitation, e.g.:**
  - Ice-sheet mass balance, Global Water Cycle, ...
  - Fluxes (air/sea, land/sea, energy, water, gases, aerosols)
  - Permafrost
  - International LAI/FAPAR reconciliation
  - Hiatus, El Nino, ...

CCI+ Schedule



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