Monitoring climate from Space

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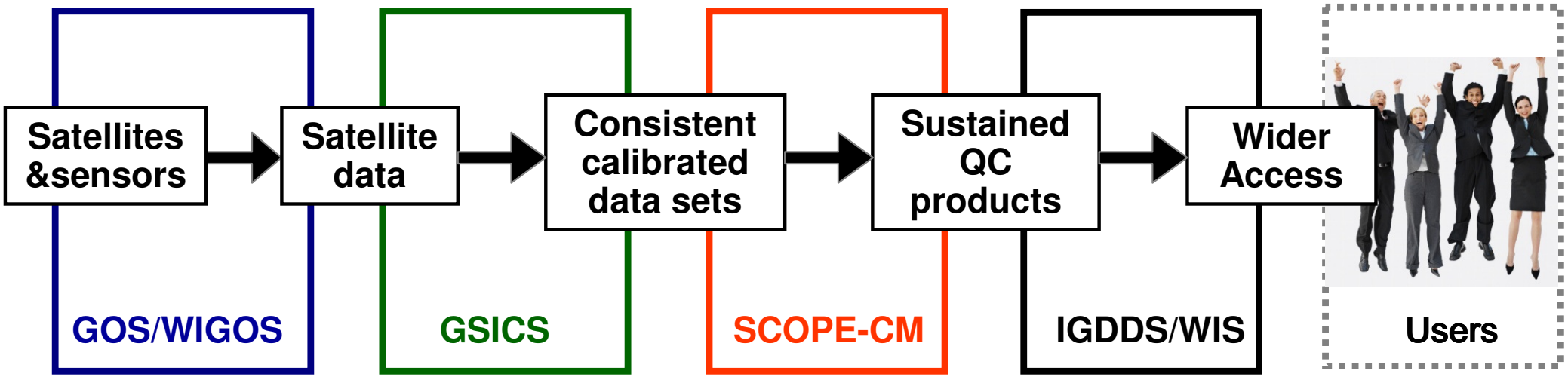
Overview

- End-to-end system in place
- Challenges for climate
- Global Observing System (GOS) – yesterday, today, and tomorrow
- Product Generation for Climate – SCOPE-CM
- Plans for the future

End-to-End System

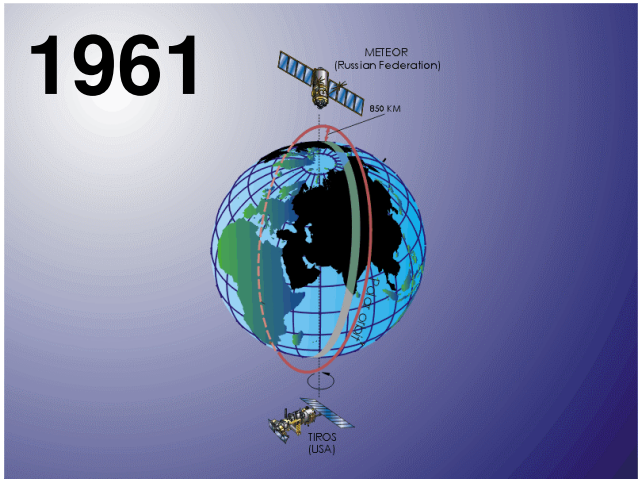


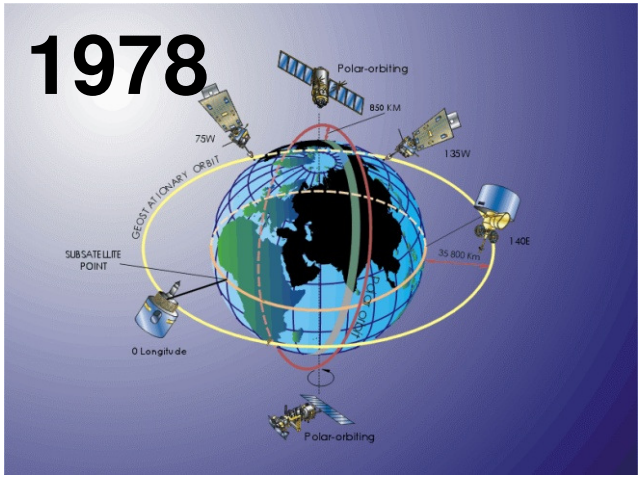
- Global Observing System (GOS)
- Global Space-based Inter-calibration System (GSICS)
- Sustained Co-Ordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM)
- Data/Product Dissemination Strategy (IGDDS / WIS)

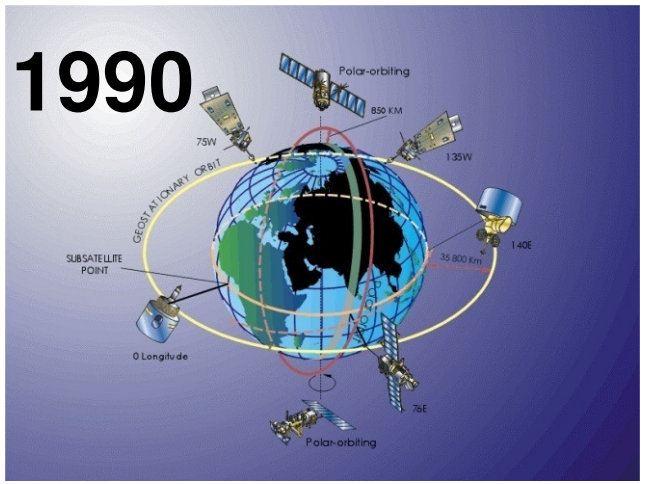
Challenges for Climate

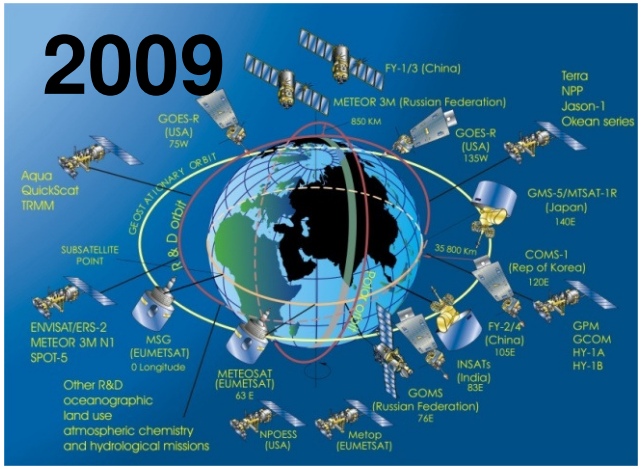
- Need long-term, uninterrupted observations
- Include Ocean and Land-Surface, Chemical Processes in the Atmosphere
- Very accurate calibration necessary
- Data stewardship, Reprocessing

WMO Space-based Global Observing System (GOS) - Yesterday





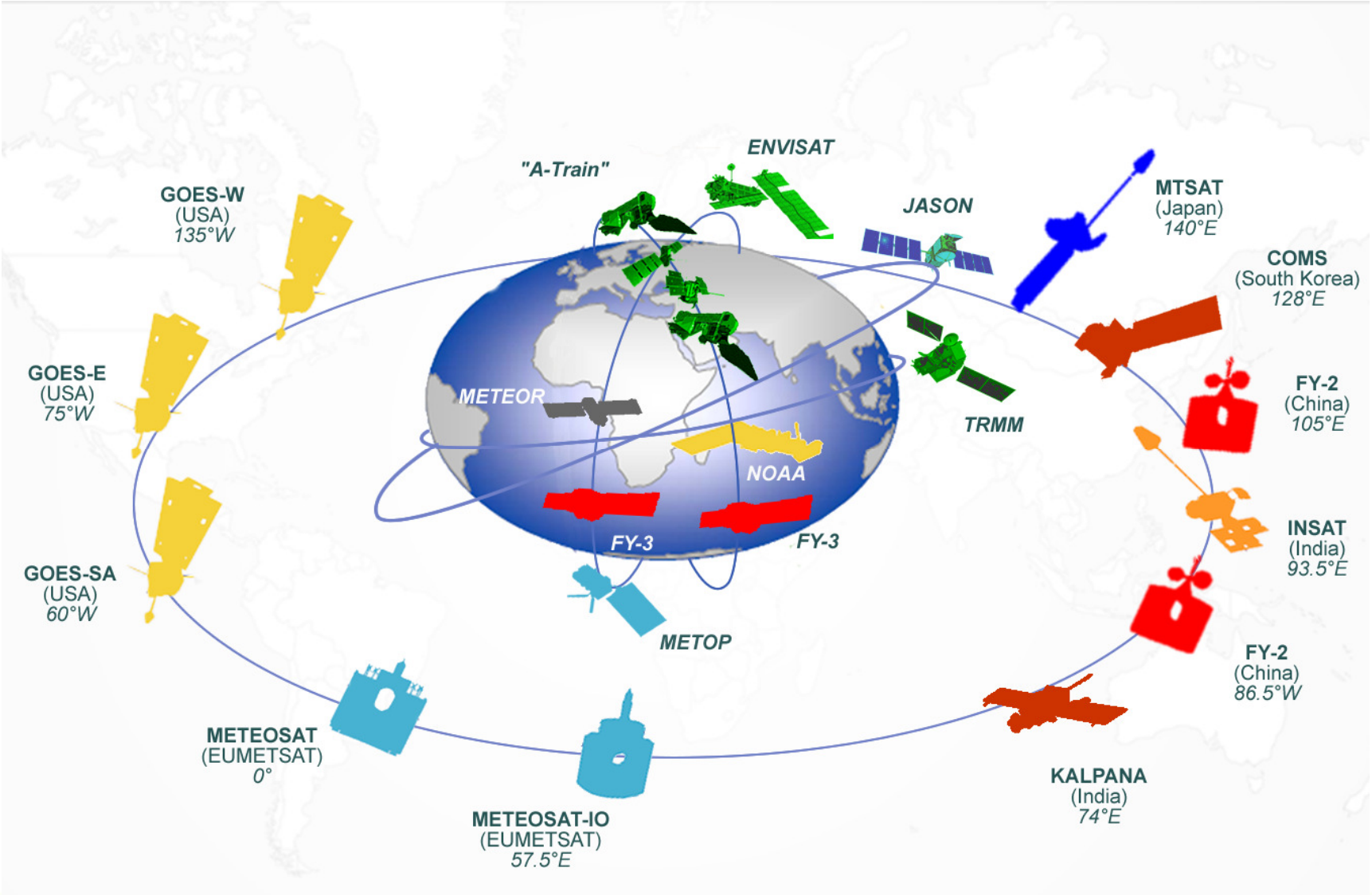




Space-based GOS Today

Modified from GEO Secretariat

Space-based GOS Today



Modified from GEO Secretariat

Satellite Missions in the "Vision for the GOS in 2025" - Tomorrow

Heritage operational missions

- **GEO: imager, HS IR sounder, lightning**
- **Sun-synchronous: imager, IR/MW sounders**

Transition from R&D to operational status

- **Ocean surface topography constellation**
- **Radio-Occultation Sounding constellation**
- **Ocean Surface Wind constellation**
- **Global Precipitation constellation**
- **Earth Radiation Budget (incl. GEO)**
- **Atmospheric Composition (incl. GEO)**
- **Ocean colour and vegetation imaging**
- **Dual-angle view IR imagery**
- **Synthetic Aperture Radar**
- **Land Surface Imaging**
- **Space Weather**

Operational pathfinders and demonstrators

- **VIS/IR imagers in HEO**
- **Doppler wind LIDAR, Low-frequency MW**
- **GEO MW**
- **GEO High-resolution narrow-band imagers**
- **Gravimetric sensors**

GCOS Essential Climate Variables (ECVs)

- List of 50 Variables (as of 2010)
- Support the work of the UNFCCC and the IPCC
- Atmospheric, Terrestrial and Oceanic Domain

Oceans

- **Sea-surface temp.**
- **Sea-surface salinity**
- **Sea level**
- **Sea state,**
- **Sea ice**
- **Surface current**
- **Ocean colour**
- **etc.**

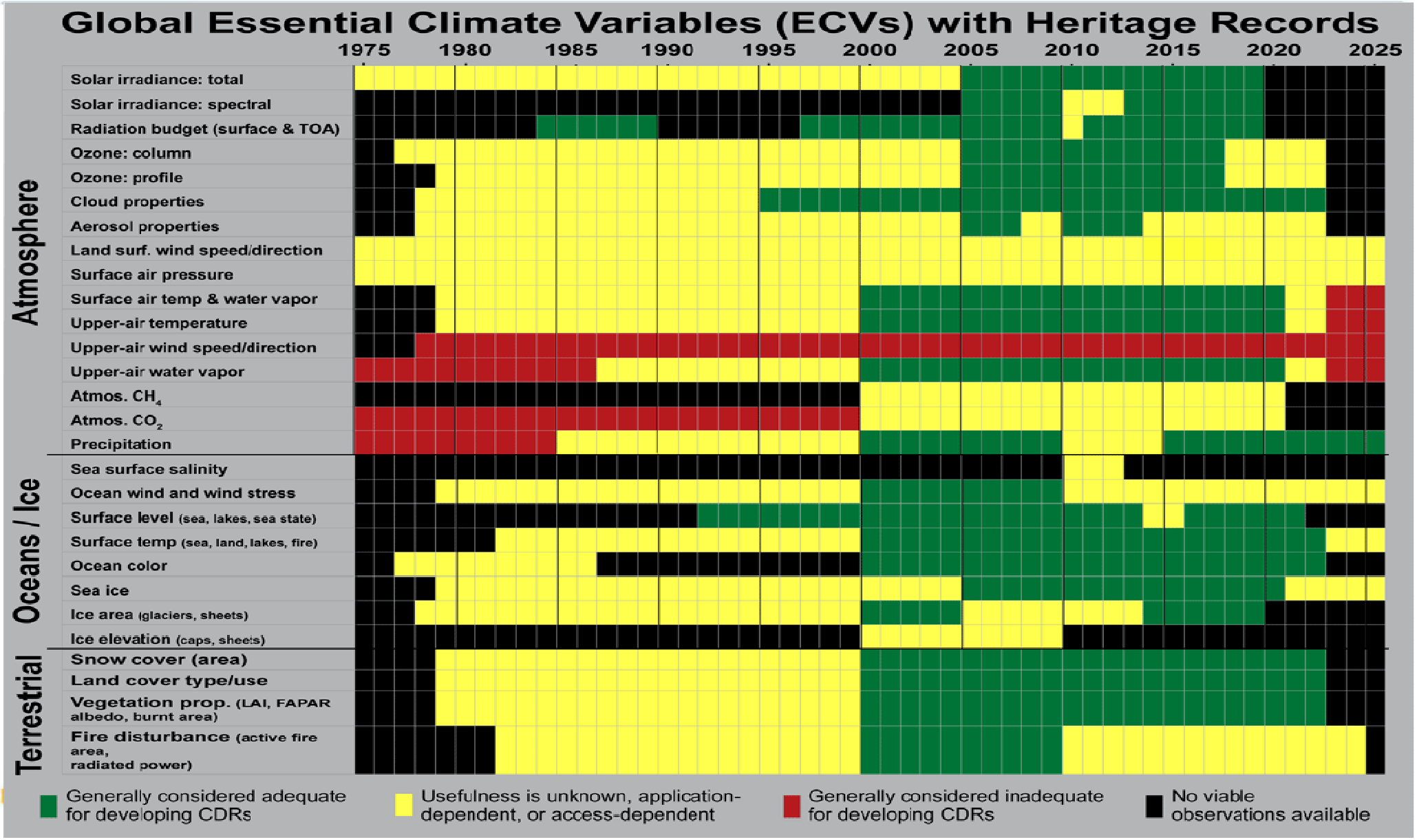
Atmosphere

- **Air temperature**
- **Wind speed and direction**
- **Water vapor**
- **Pressure**
- **Surface radiation budget**
- **Ozone**
- **Carbon dioxide**
- **etc**

Terrestrial

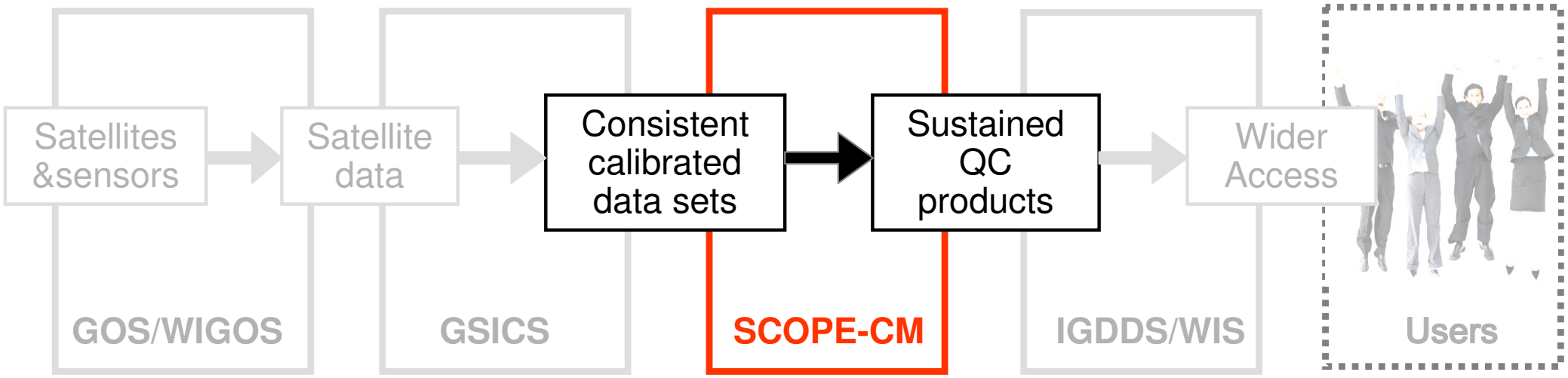
- **River discharge**
- **Water use**
- **Groundwater**
- **Lakes**
- **Snow cover**
- **Glaciers and ice caps**
- **Ice sheets**
- **etc.**

Need for Long-term Observations of ECVs



Source: NOAA

Product Generation – SCOPE-CM



Sustained Co-Ordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM)

Provides for:

- Global products
- Sustained into the future
- Coordinated internationally

SCOPE-CM Pilot Projects

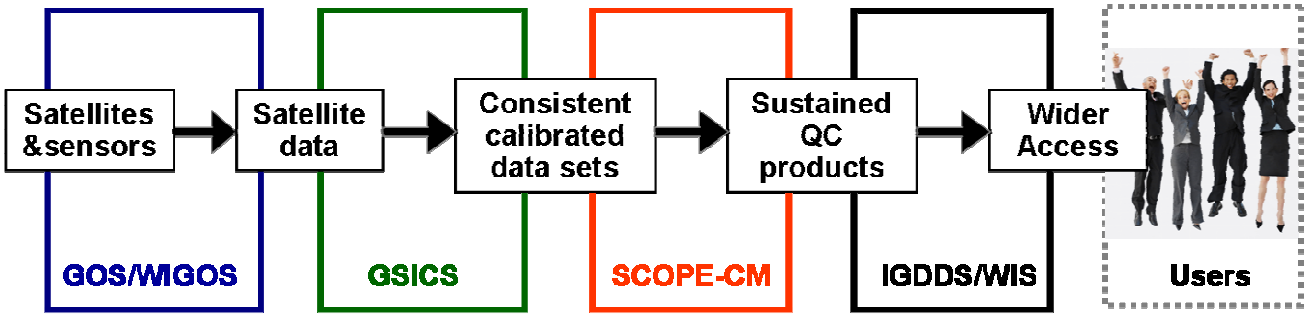
	Parameters and topics	*Sensors*	*Lead*	*Contributors*
1	Clouds and Aerosols	AVHRR	NOAA	CM SAF
2	Water vapour, clouds, precipitation	SSM/I	CM SAF	NOAA
3	Surface albedo, clouds and aerosols	GEO	EUMETSAT	EUMETSAT, NOAA
4	Winds and clear sky radiances	GEO	EUMETSAT	EUMETSAT
5	Upper tropospheric humidity	GEO	NOAA	EUMETSAT, EUMETSAT, CM SAF

Plans for the Future

- Implement the Vision for the GOS in 2025
- Increase coordination and cooperation – recognizing different, but complementary roles and responsibilities
- Leverage the end-to-end system that exists for the Weather Constellation of GOS for a Climate Constellation

Summary

- End-to-end system for weather and climate



- Need for
  - Long-term, uninterrupted observations
  - Additional measurements
  - Improved calibration
- Plans for the future
  - Leverage existing system
  - Build up a space based architecture for climate