WMO SPACE PROGRAMME and IGDDS and RARS projects

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WMO Space Programme

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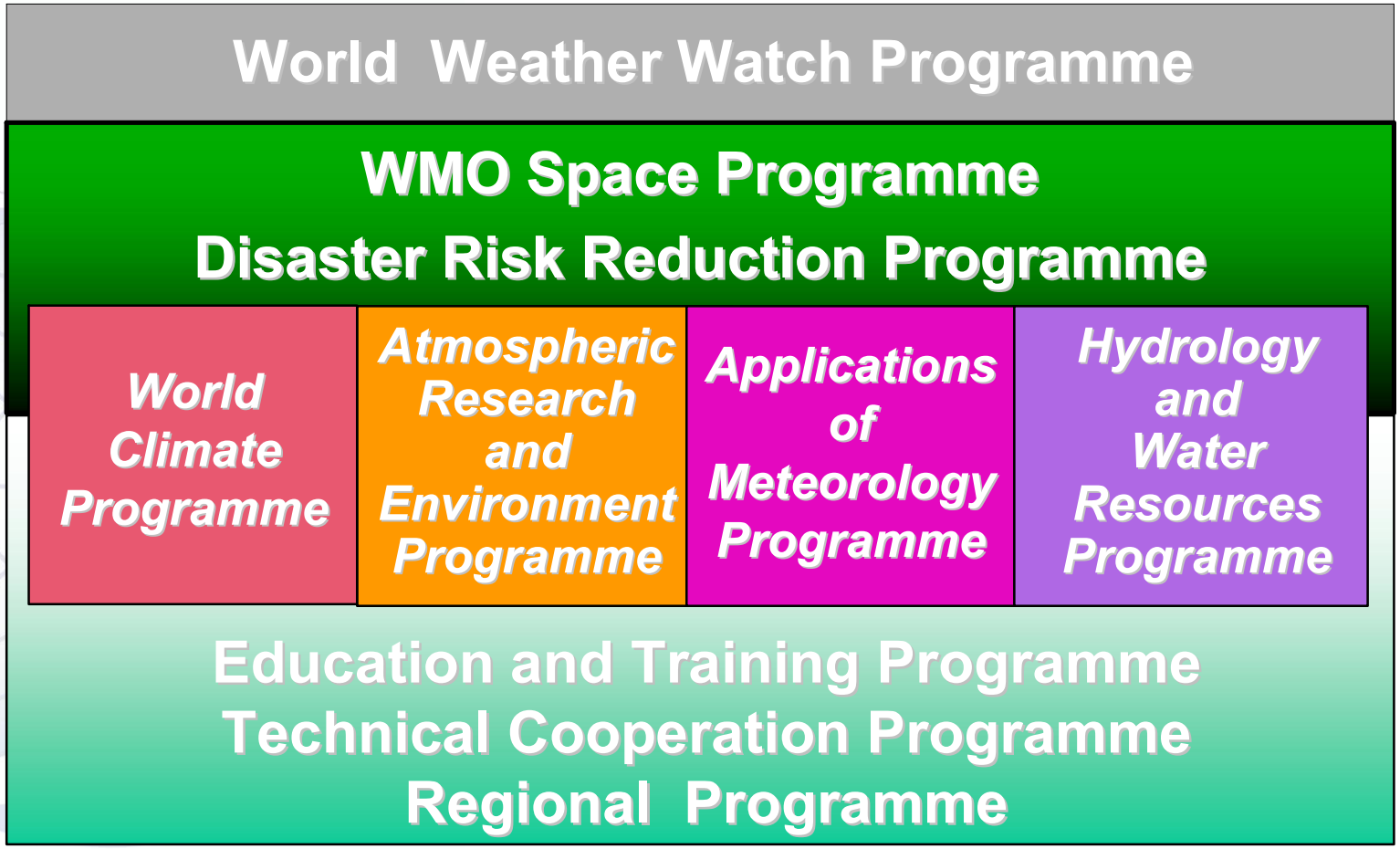
WMO
OMM

Overview

- The WMO Space Programme
- The space-based GOS
- User-oriented activities
- Details on IGDDS
- Details on RARS

WMO Programmes



…and WMO-co-sponsored Programmes (e.g. WCRP and GCOS)

Main WMO Space Programme activities

involving WMO Members, their Space Agencies, and CGMS

Collect requirements for space-based observations and related services

User requirements database

Global planning optimization

agencies

Plan / implement space-based GOS

Users

Ensure sat data quality

Intercalibration
GSICS

User information and training

Website
Documents
Training events
Virtual Laboratory

Support product generation

Facilitate data access

IGDDS-RARS projects
Access to R&D data

Regional Specialized Centres

Overview

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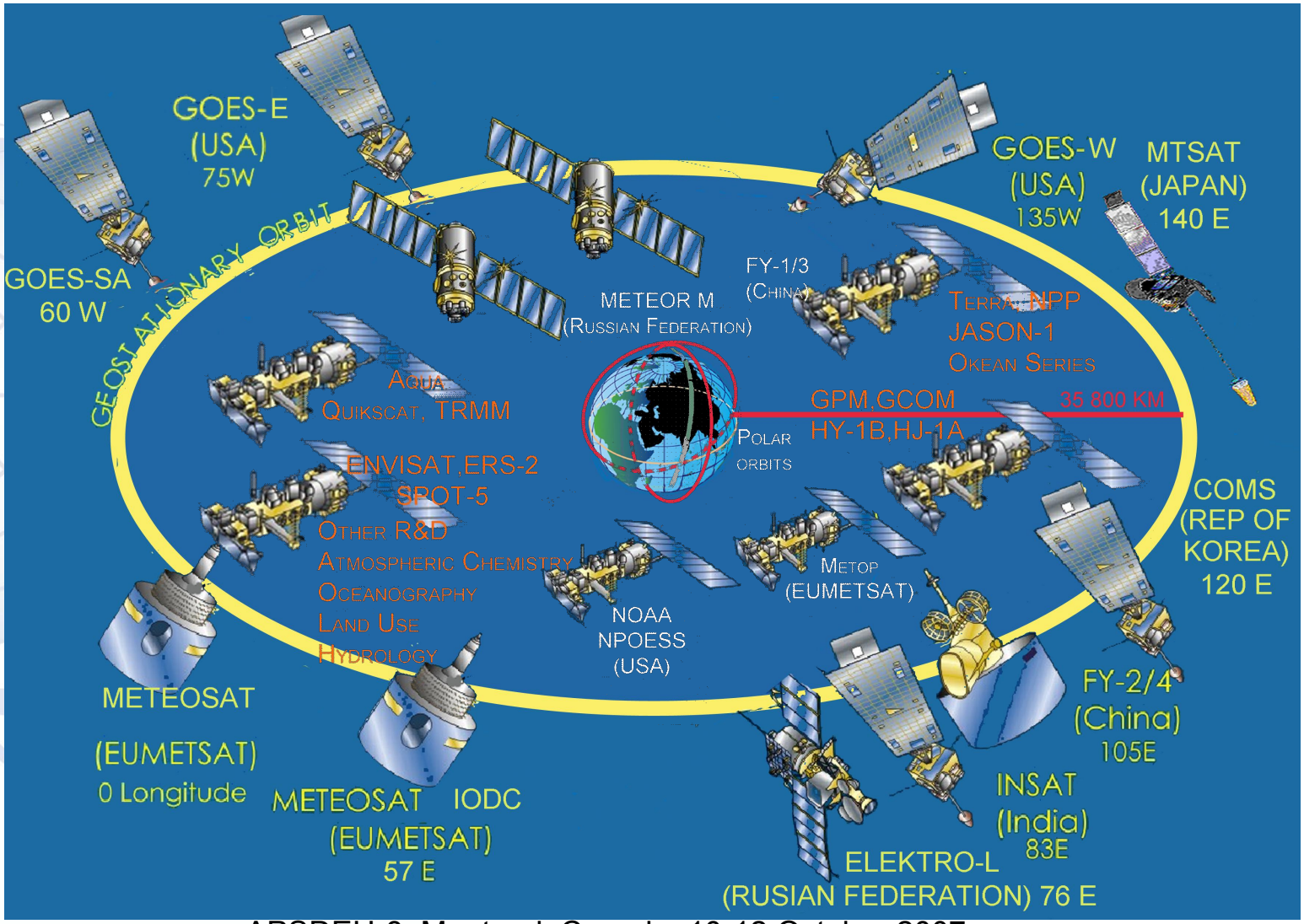
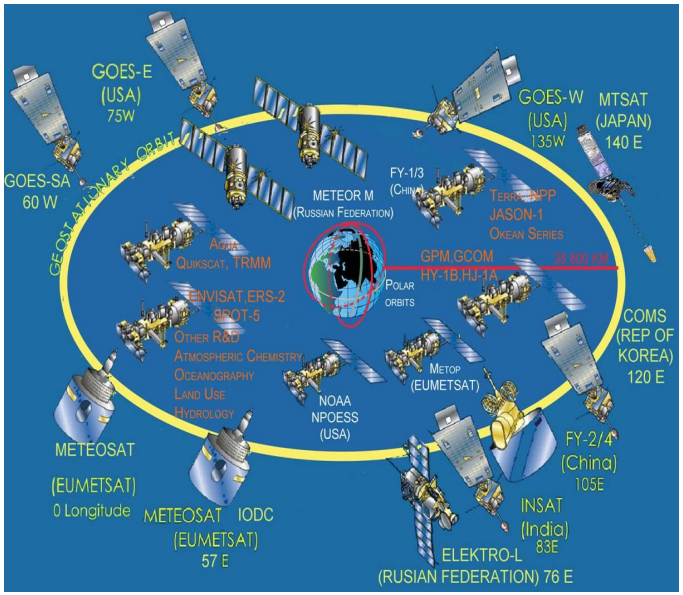
Space-Based component of the Global Observing System (GOS)



The current space-based GOS

- Geostationary constellation
- Polar-orbiting sun-synchronous constellation
- R&D satellites with no guarantee for continuity

➢ Focus on operational weather forecasting



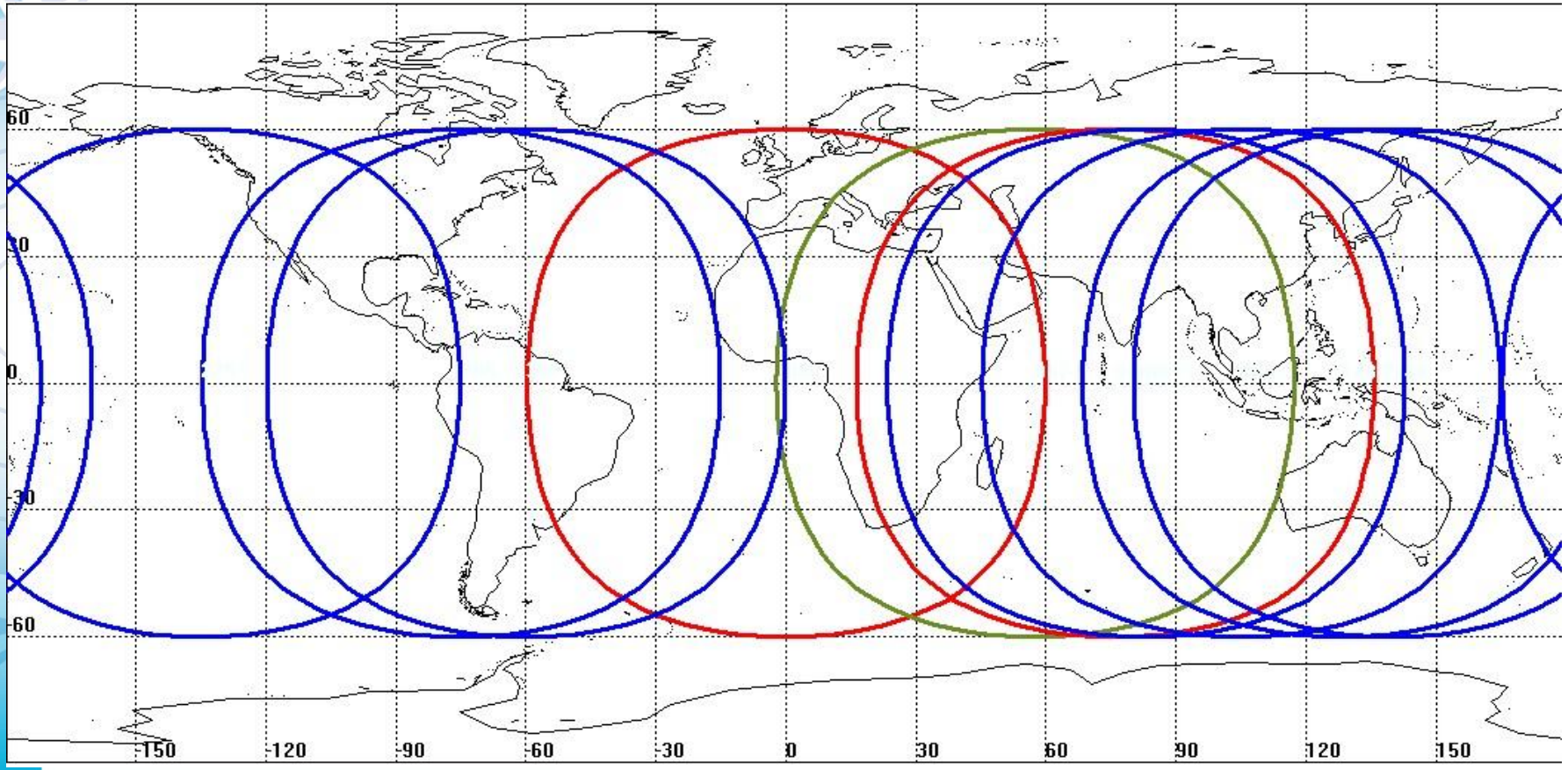
New vision for the GOS to 2025

(1) Optimized (2) Updated (3) For climate monitoring

- Optimize current operational constellations
  - geostationary => nominal longitudes
  - Polar-orbiting => Equatorial Crossing Time
- Update observation strategy
  - ocean surface topography (optimal orbits /instruments)
  - ocean surface wind (scatterometer+ polarized MWI)
  - Radio-Occultation Sounding (constellation)
- Transition from R&D to operations for new ECVs
  - Global Precipitation (active core + MWI constellation)
  - ERB
  - Atmospheric chemistry
  - Specific Imagery (ocean colour, vegetation,..)
  - Possible HEO missions for high-latitude

(1) Optimizing the Geostationary constellation

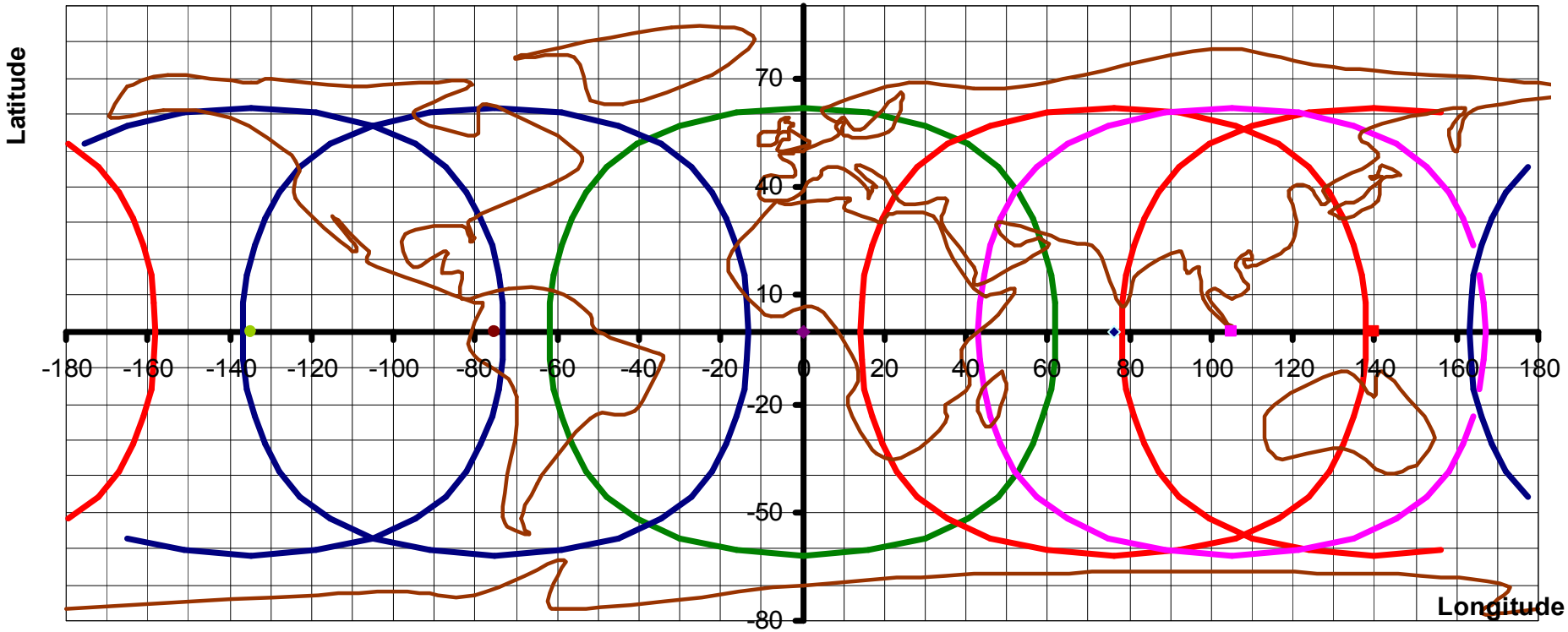
Current plans for 2009



(1) Optimizing the Geostationary constellation

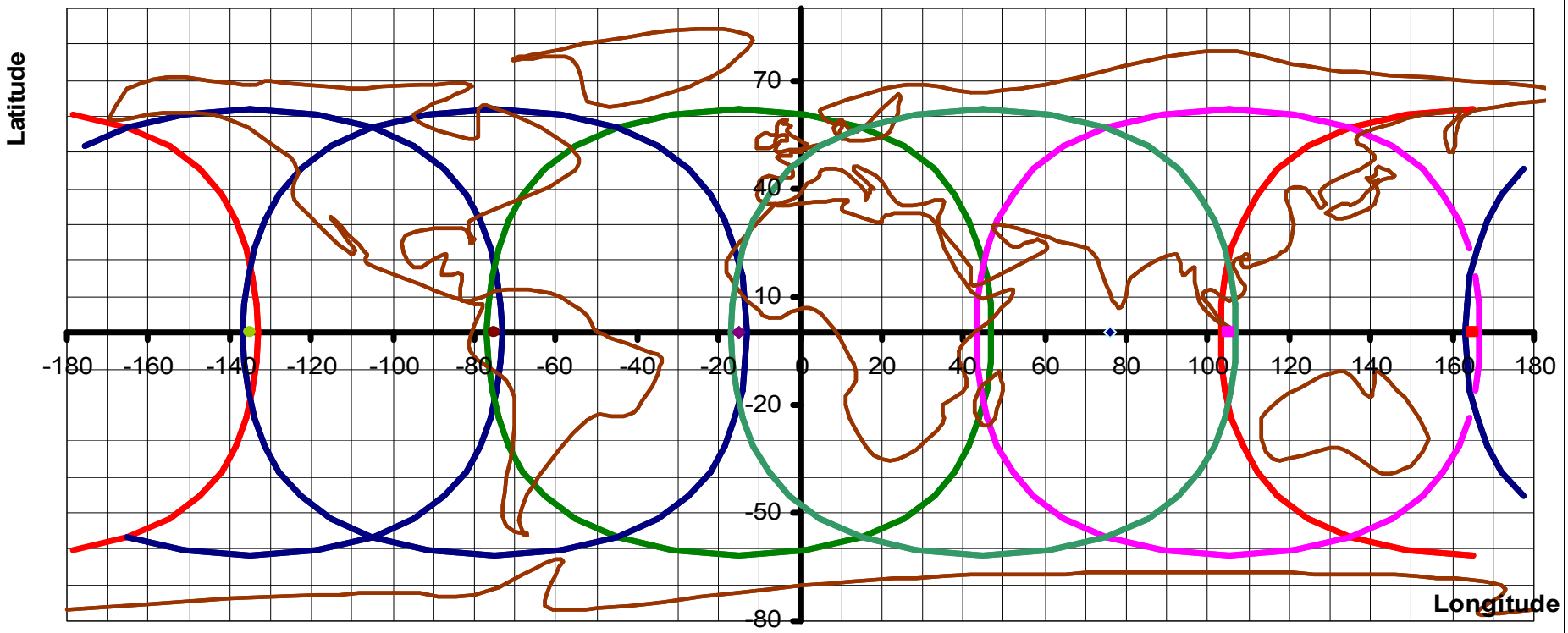
Current nominal locations : 135 W, 75W, 0, 76 E, 105 E, 140 E

Footprints for a maximum zenith angle < 70 deg



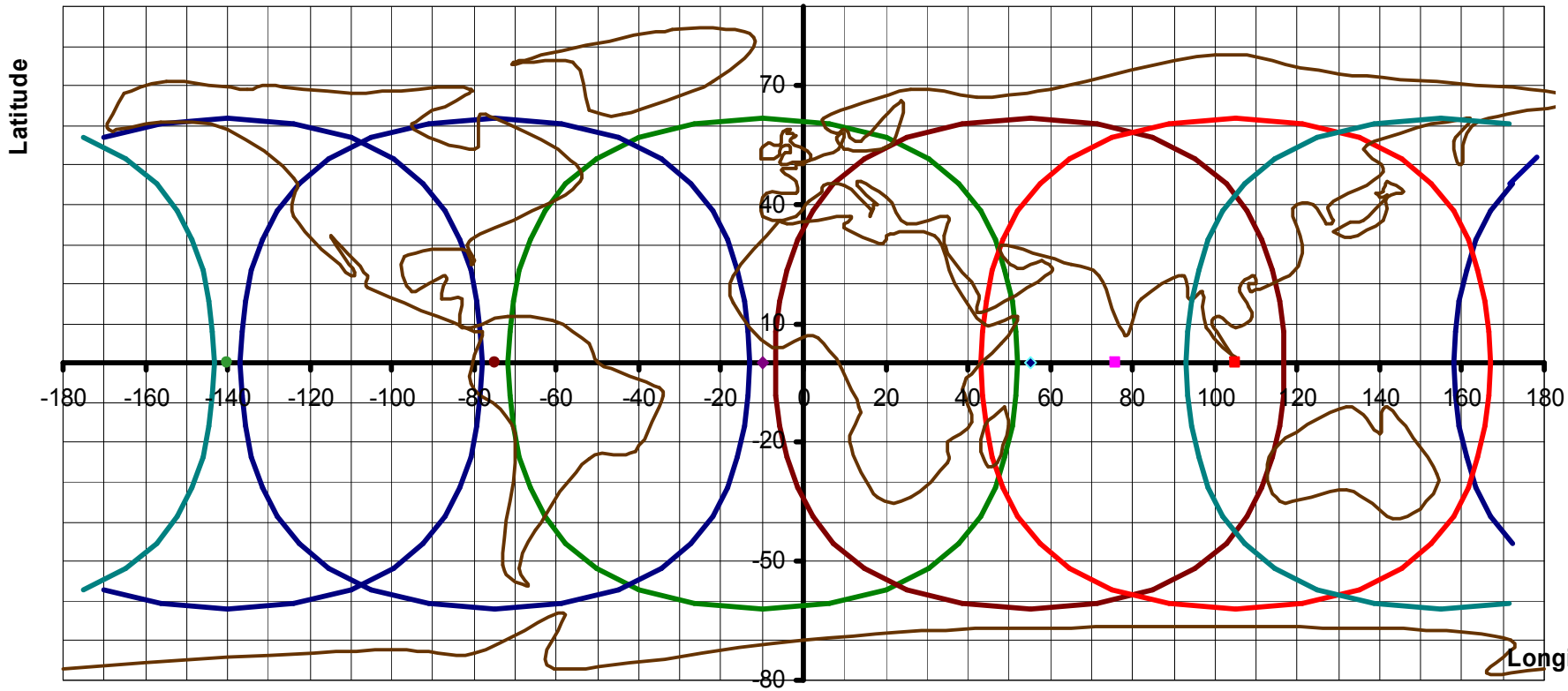
(1) Optimizing the Geostationary constellation

Recommendation: at least 6 satellites separated by ≤ 60° longitude with multispectral imager & hyperspectral sounder



(1) Optimizing the Geostationary constellation

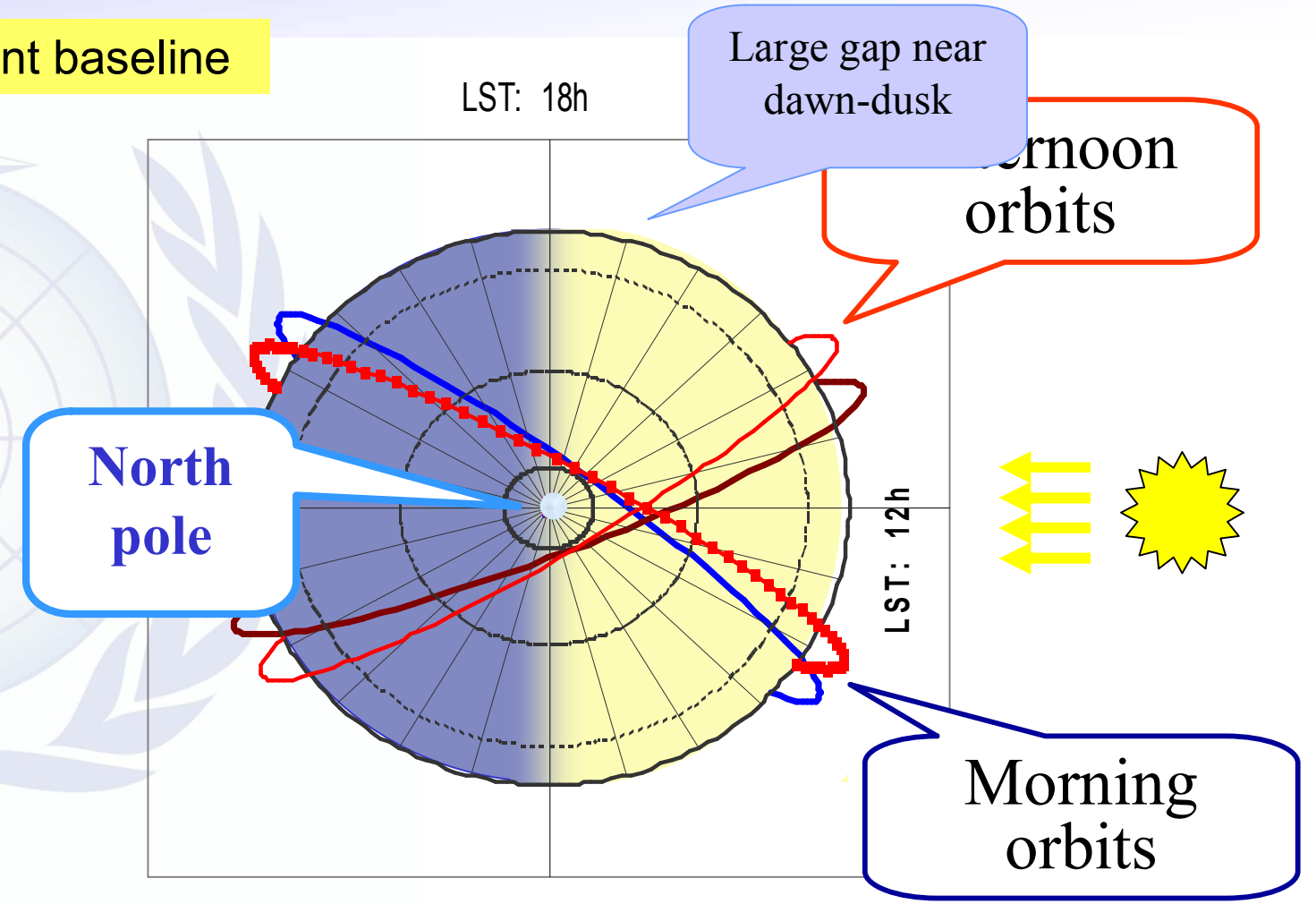
Trade-off example: separation ≤ 65 deg



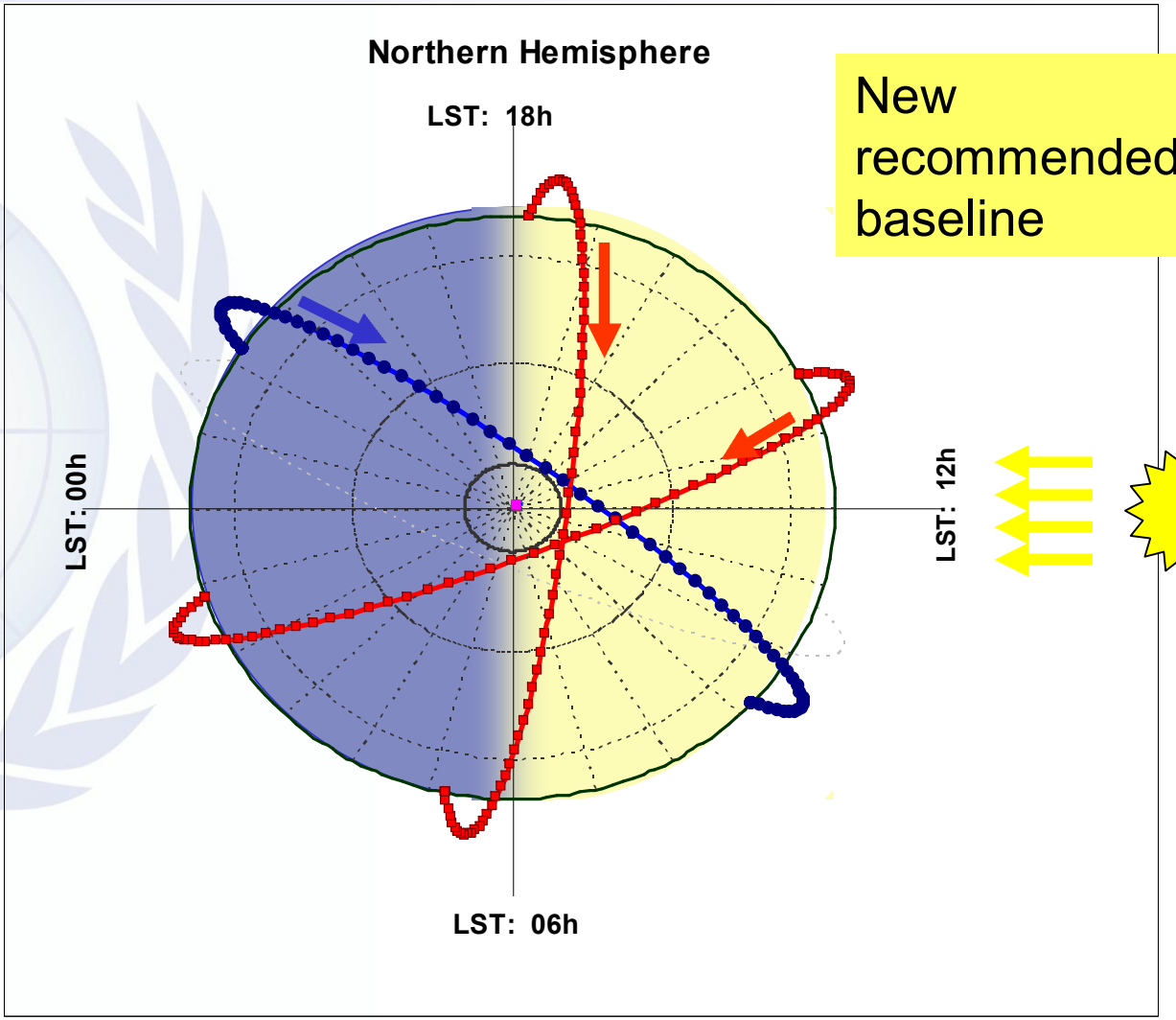
Example: 140W, 75W, 10W, 55 E, 105E, 155E

(2) Optimizing sun-synchronous IR/ MW sounding missions

Current baseline

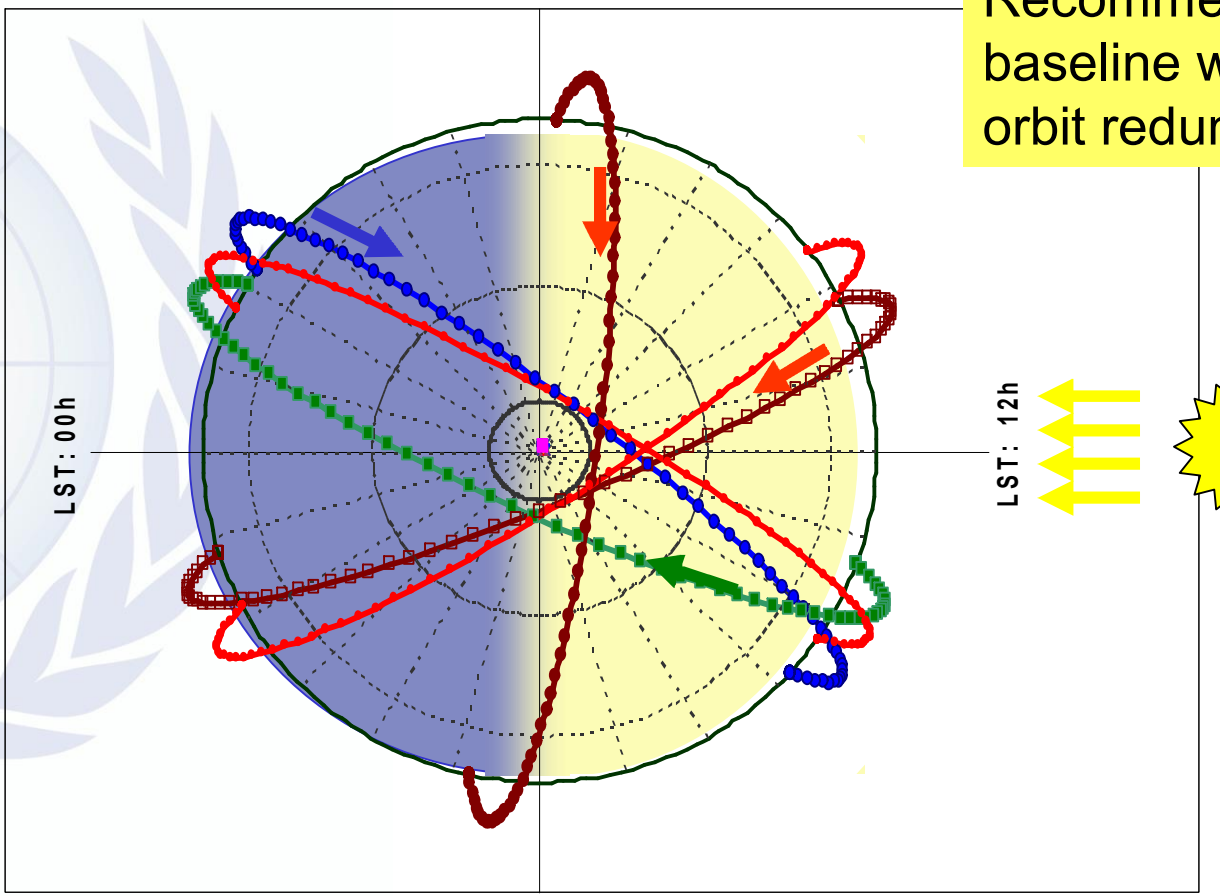


(2) Optimizing sun-synchronous IR/ MW sounding missions



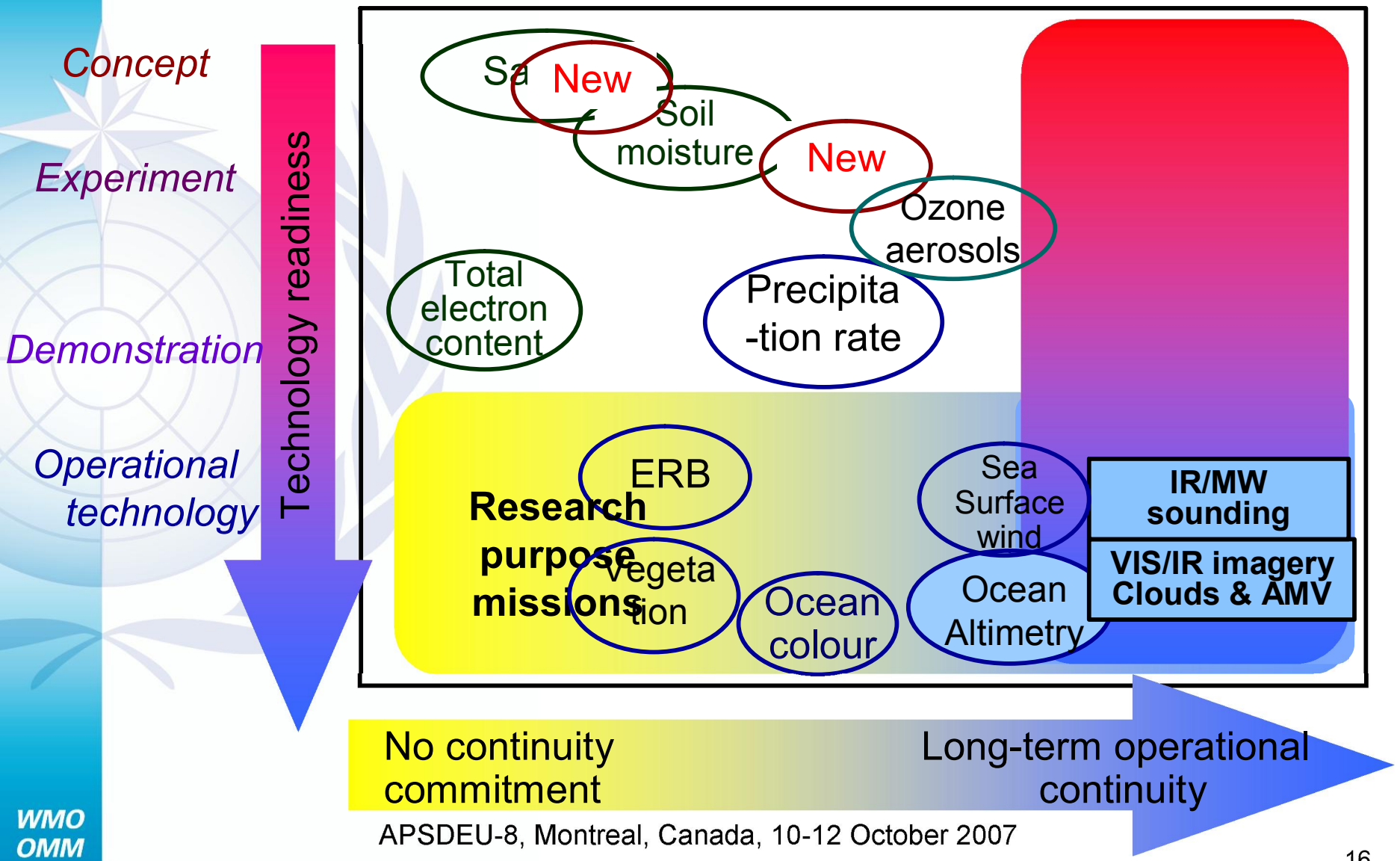
New recommended baseline

(2) Optimizing sun-synchronous IR/ MW sounding missions



Recommended baseline with in-orbit redundancy

Transition of R&D missions to operations



Vision of the GOS to 2025
Forward looking but affordable

- Serving broader objectives, contributing to several GEOSS SBA (weather, climate, health, disasters…)
- Enhanced and diversified infrastructure
- More commitments on long-term continuity
- Requires more resources

- ➢ Enabled by wider community of GOS contributors
- ➢ Need enhanced cooperation to optimize global effort
- ➢ Ensuring data exchange and consistent data quality

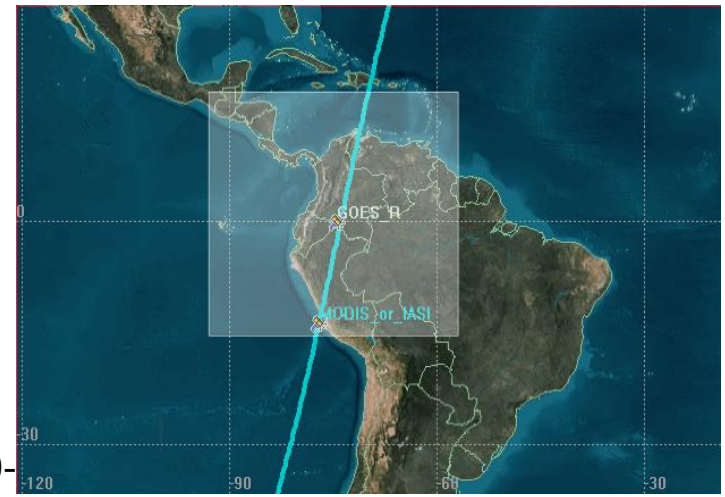
Global Satellite Inter-Calibration System (GSICS)

POLAR- POLAR intercalibration

- **To ensure consistency of datasets from different missions and operator**

- Images: courtesy of Mitch Goldberg, NOAA/NESDIS

GEO versus Polar-orbiting



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- User-oriented activities
- Details on IGDDS
- Details on RARS

User-oriented activities

- Facilitating data access
  - Integrated Data Dissemination Service (IGDDS) for a Global, cost-efficient and timely access to all required data
  - RARS to improve timeliness of key polar data
  - Promote use of R&D satellite data
- Regional Specialized Satellite Centres
  - Generate quality-controlled high-level products for (1) climate monitoring and (2) other applications
- User Information
  - New Web site
- User training
  - Virtual laboratory, centres of excellence

User Information

- WMO Space Programme home page
  www.wmo.int/pages/prog/sat 

- RARS pages 
- GSICS page 
- Satellites 
- Schedule 
- Glossary
- Documents (Reports, Technical documents..)

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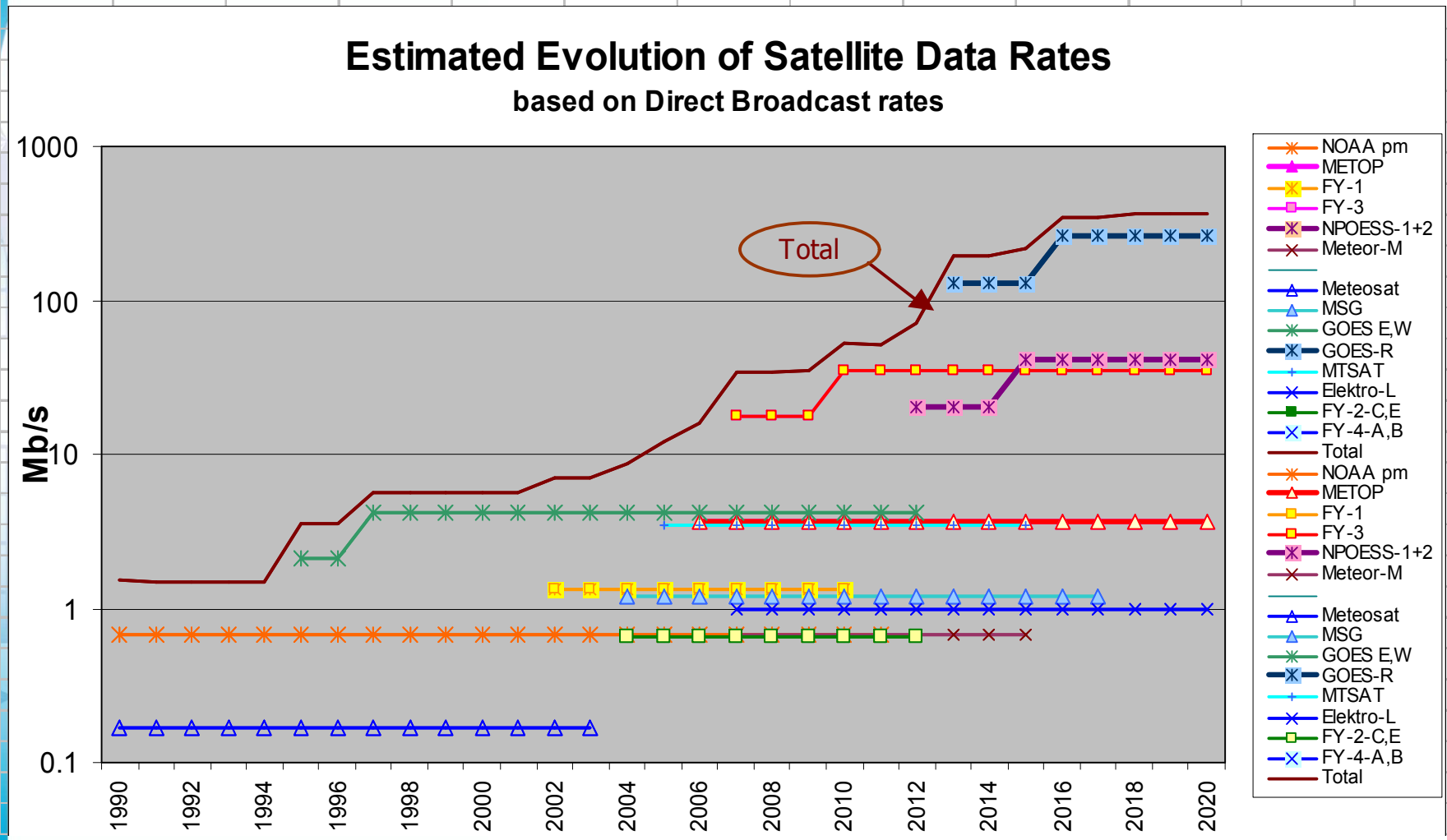
Data access aspects (1)



Background to the IGDDS

- Need for global and timely access to increasing amount of satellite data and products …
- …from multiple sources through integrated systems
- Integral part of the WIS (and GEOSS)
- Need cost-effective and scalable infrastructure

➢ take advantage of DVB-S broadcast services

➢ + Internet, classical GTS, and Direct Broadcast

IGDDS and GEONETCast

- GEONETCast could be viewed as the expansion of the IGDDS satellite dissemination to include data from other SBAs
- GEONETCast may use the same basic dissemination infrastructure as IGDDS although additional bandwidth needed to accommodate additional data for other SBAs

IGDDS – Functional Scope and Focus

- Main functions:
  - Data concentration and inter-regional data exchange
  - Data dissemination (predominantly via telecom satellite direct broadcast) with quasi-global coverage
  - Data access on request (allowing data discovery and delivery to authorized users)
  - Data and user management including interoperable catalogue, quality of service monitoring and user support
- Focus on real-time dissemination (time-critical data)

IGDDS – Dissemination Requirements from the IGDDS Implementation Plan

- All Continents in all WMO Regions to be covered by the IGDDS (possibly using a combination of dissemination mechanisms)
- Data from multiple observing systems to be disseminated in an integrated manner
- Reception terminals to be openly available at an affordable price
- Data to be disseminated in internationally agreed formats
- Data-handling priority scheme to ensure optimal timeliness
- Operational nature (reliable and continuous)
- …….

➢ *Regional hubs (DCPC) designated by CBS and relevant RA*

IGDDS - Implementation Issues

- Implementation relies on:
  - IGDDS Implementation Plan
  - IGDDS Implementation Group (IGDDS-IG1: July 2007,Geneva)

- Implementation Group discussed 6 critical aspects
  1. Identification of data requirements in each region
  2. Establishing quasi-global dissemination coverage
  3. Ensuring sustainability and robustness
  4. Data exchange mechanisms between regional hubs
  5. Provision of appropriate user support
  6. Compliance with WIS standards for catalogue interoperability

IGDDS - Priority Actions and Challenges (1)

Identification of regional data requirements

- ensure appropriate mechanisms for gathering requirements
- focus on real-time aspects
- regional consultation/enquiries & input from APSDEU/NAEDEX
  - Europe requirements well captured by EUMETSAT consultations
  - Africa: action planned via “EUMETSAT User Forum”
  - For the Americas and the Asia-Pacific regions this is open

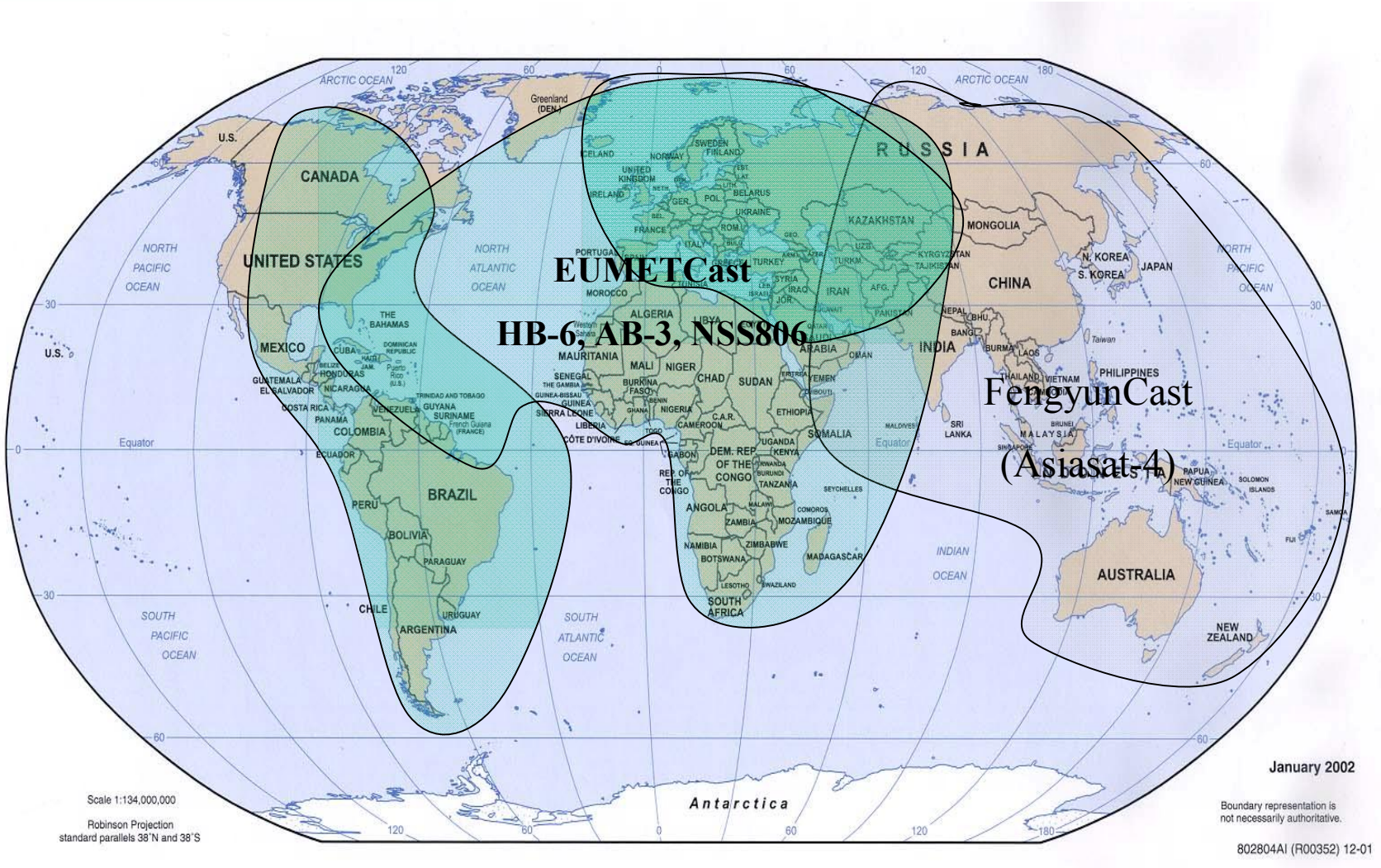
IGDDS-IG1 agreed several actions:

- **Roshydromet will provide sub-regional requirements**
- **CMA to indicate FengYunCast dissemination content**
- **APSDEU partners to propose additions for consideration by CMA**

IGDDS - Priority Actions and Challenges (2)
Establishing a quasi-global coverage

- EUMETCast Ku Band over Europe and EUMETCast C-band over Europe+Africa well established
- EUMETCast C-band over Americas
  - only until 2008 (pilot action)
- Geonetcast-Americas
  - not intended for meteorological sat imagery
- Feng-Yuncast C-band over Asia-Pacific
  - Operational but still mainly a national system
- Roshydromet's MITRA system covers Europe and part of Asia
  - Scope and availability TBC

IGDDS – Satellite Dissemination Coverage Footprints



IGDDS - Priority Actions and Challenges (3)
Ensure sustainability and robustness

- Integrating many data flows in a one-stop shop results in an increased exposure to single point failures
- Strategic redundancy increasingly important to ensure long-term data continuity
- IGDDS standards to ensure that “strategic redundancy” is addressed at appropriate levels taking advantage of
  - ground and space-based telecommunications capabilities
  - interconnectivity between DCPCs and GISCs [WMO Information System (WIS) elements]

IGDDS - Priority Actions and Challenges (4)
Data exchange mechanisms between regions

- For the foreseeable future a combination of the following mechanisms will be used:
  - Dedicated links
  - GTS and extensions thereof
  - Internet
  - Overlapping dissemination footprints
- Situation is still evolving
  - Final number of regional hubs not yet fixed (3 or 4) – could affect the data exchange network architecture
  - Data exchange requirements need to be captured and monitored (linked to identification of regional requirements)

IGDDS - Priority Actions and Challenges (5)

Appropriate user support arrangements

- The extension of the Chinese national FengYunCast system to the full Asia-Pacific region requires user support arrangements (particularly from the language viewpoint)
- ABoM is assisting as a pilot user in the A-P region and this pilot activity is expected to identify the main user support areas which need further development

IGDDS - Priority Actions and Challenges (6)

Compliance with applicable WIS standards

- The IGDDS Implementation Group underlined
  - WIS filenaming convention
  - WIS Core Metadata Profile standards
- Applying the WIS standard enhances global interoperability which is a key for contributing to GEOSS
- EUMETSAT took the action to investigate the implications of applying this convention and standards to ATOVS data as a test case (due date mid-November 2007)

Conclusions on IGDDS

- Several challenges
- Good momentum in the context of WIS and GEOSS/Geonetcast
- Progress expected through pilot actions:
  - AP data requirements for FY Cast
  - BOM as pilot foreign user of FY Cast
  - EUMETSAT to test metadata and file namimg convention
  - Data requirements….

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RARS Implementation Group (1)

First meeting July 2007

- Outreach and customer links:
  - Report to ITSC
  - Seek feedback from RA rapporteurs on space
  - WMO web pages on RARS updated
  - Regional RARS pages to be developed

- Several actions on coding/ file naming/ identifiers
  - Proposal to use file transmission rather than bulletin
  - Actions coordinated with ET-DRC
  - Stabilizing filenames/headers before wide announcements

RARS Implementation Group (2)

- Global monitoring by EUMETSAT NWP SAF when data routinely available
- Extend RARS concept to other datasets than NOAA/ATOVS
  - METOP/ATOVS
  - ASCAT
  - FY-3-A, -3B ?
  - NPP ?
- RARS project greatly appreciated by user community

RARS Implementation Group (3)
Global RARS network coverage

Planned extensions

- EARS will include La Reunion island and Oman
- Contacts with South-Africa…
- Start of South-American RARS confirmed end 2007
- Confirmed expansion of AP-RARS

Optimization of RARS coverage

- Some overlap between stations in AP (Guangzhou/Hong-Kong)
- Some gaps in central Pacific, South Atlantic, Africa, Central America..

STATUS OF THE RARS NETWORK as of July 2007

- See table
- see map

MTSAT launch, by courtesy of JMA