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ET-SAT Considerations on the Vision of WIGOS Space-based Component in 2040

Jérôme Lafeuille
(WMO Space Programme)
Mikael Rattenborg

Background

- CBS-Ext(2014) supported the initiative to develop a «Vision of WIGOS component observing systems in 2040»
- New horizon (2040) chosen far enough to be ahead of established satellite programmes
- New Vision shall be developed under coordination by IPET-OSDE
- Would ultimately replace the «Vision in 2025»
- To be developed in 2015-2016 for adoption by CBS in 2nd half of 2016



Main drivers for updating the 2025 Vision

- Emerging user requirements not captured in the Vision-2025
 - Hydrology, atmospheric composition, cryosphere watch, space weather were hardly addressed
- Advances in technology
 - Sensor technology
 - Orbital concepts
 - Small satellites, constellations
 - Data circulation scheme
- Changes in the providers' community
 - More space faring nations
 - Cost/benefit
 - Public/private



User application needs from the SOG

- The needs expressed in the Statements of Guidance are addressed in the Vision for 2025
- In 2015 many but *not all* the 2025 targets are achieved
 - e.g. GEO hyperspectral IR
- The SOG call for higher resolution (spatial, temporal, radiometric) which is not specified in the Vision
 - e.g. AMV quality, MW imagery resolution, GNSS RO coverage
- Some mission concepts need to be demonstrated
 - Doppler lidar, GEO MW, HEO imagery, Cloud radar, gravity field



New/emerging needs

- Former «pathfinders» to be considered operational candidates
 - Low-frequency MW salinity/soil moisture
 - Doppler lidar for 3D wind & aerosol
 - HEO imagery for sea ice, polar winds and volcano watch
 - Gravity field for underground water storage
- Limb sounding for atmospheric composition
- Lidar altimetry for hydrology and cryosphere
- Sub-mm imagery for cloud phase
- Multi-angle, multi-polarization radiometry for aerosol and radiation budget
- NIR spectrometry for surface pressure
- Solar wind observation at Lagrangian point L1 and heliospheric imagery at L5



Consequences of growing role of numerical modeling

- Requires improved time/space resolution and timeliness
- Reinforces the requirement for 3D wind and surface pressure
- Need good error characterization
- Some anchor measurements to control the model bias
- Continuity of data records for reanalysis purpose



Technology advances/ sensors

- Better sensors, better geometric/radiometric resolution
- Spectrum better exploited: UV, far IR, MW
- Hyperspectral sensors in UV, VIS, NIR, IR, MW
- Combinations of active/passive (including bi-static)
- Better use of polarimetric measurements (incl. with SAR)
- Diversification of GNSS RO
 - additional frequencies, large constellations, ionospheric scintillation
 - Direct and reflected signals..
- Note however the radiofrequency spectrum protection issue



Technology advances/ satellite systems

- More satellite providers, allowing more diverse orbits
 - HEO-GEO-MEO-LEO (inclined and sun-sync) and low altitude platforms
 - Backbone system (GEO + LEO in 3 sun-sync orbital planes) augmented by satellites at various ECT and inclined orbits
 - Other, more novel concepts
 - In-orbit measurement reference standards for calibration, traceability
- Consequences
 - Robustness from diversity , resilience requires user agility
 - Interoperability is a key requirement
- Data circulation
 - large data volumes and short latency
 - Security issues, interoperability/standardization, LT preservation



Changes in the providers' community

- Operational, R&D, and Transition programmes
 - General principles and required flexibility
- International commitments by government-designated entities towards global optimization and interoperability
 - «backbone» system must provide essential data
- New business models possibly involving commercial initiatives
 - Possible issues of transparency (reliability), data access, coordination
 - Can supplement the public «backbone system»
- Other models could facilitate broad participation
 - Similar to CLS-ARGOS, or the DMC-constellation



Need interaction with applications

- Difficulty to anticipate user needs 25 years ahead
- Users are not aware of potential future capabilities
- Space agencies need to understand the needs
- Recommended dialogue in a «WIGOS Space 2040 workshop»
 - Tentatively in October 2015 3-days
 - With ET-SAT and possibly other agencies
 - With representatives of WMO programmes (GAW, GCW, Hydrology..)
 - With representatives of IPET-OSDE, IPET-SUP, Chairs IOS..



Thank you for your attention!

Your feedback is welcome

jlafeuille@wmo.int