

Requirements for Measuring Wind Profiles in Post-EPS

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Preparation activities for EUMETSAT Polar System (EPS): Background

Approach approved by EUMETSAT Council Nov. 2003

Current focus is on establishing Mission Requirements:

- Starting point is MTG User Consultation
- User needs/priorities from application, technology-free perspective
- Assessment of observing techniques suitable from GEO/LEO
- Updates expected, especially with demonstration of new capabilities

Need for expansion of EUMETSAT User Consultation: from MTG to Post-EPS

- **Oceanography was only partially addressed in Global NWP**
- **Atmospheric chemistry & carbon cycle (focus was $dT < 1$ hour)**
- **Land surface analysis at large scale (meteorology only addressed)**
- **Climate monitoring (no specific requests for products, however better calibration and characterisation needed)**

Observing techniques:

- **Full assessment of LEO capabilities as focus was GEO**

Application Experts Groups (AEG)

- Support of EUMETSAT user consultation towards Post-EPS
- Analysing the needs of EUMETSAT users in the 2019+ timeframe
 - Starting with MTG Position Papers
 - Global numerical weather prediction
 - Regional numerical weather prediction
 - Nowcasting
 - Analysing the evolution of those applications
 - Taking account of further applications:
 - Operational oceanography
 - Atmospheric chemistry and carbon cycle (protocol monitoring and air quality)
 - Land surface analysis at large scale
 - Climate monitoring
- Formulation of EUMETSAT user needs: **Position Papers**

User Requirements Definition (1)

Step 1

Initial formulation of potential user requirements for each parameter:

- List of objective and threshold requirements,
 - Objective: Observation goal
 - Threshold: Minimum level for usefulness
- Accuracy
- Spatial sampling
- Temporal sampling
- Data latency
- Breakthrough level: Expected to make a delta improvement in the targeted service
- Priority

Basis for AEG discussion and subsequent user consultation

User Requirements Definition (2)

Step 2

Initial assessment of suitable observation techniques

For each potential user requirement:

- Broad identification of observation techniques
- Identification of precursor instruments/missions
- Estimation of performance against threshold-objective range

User Requirements Definition (3)

Step 3 Generation of Mission Requirements

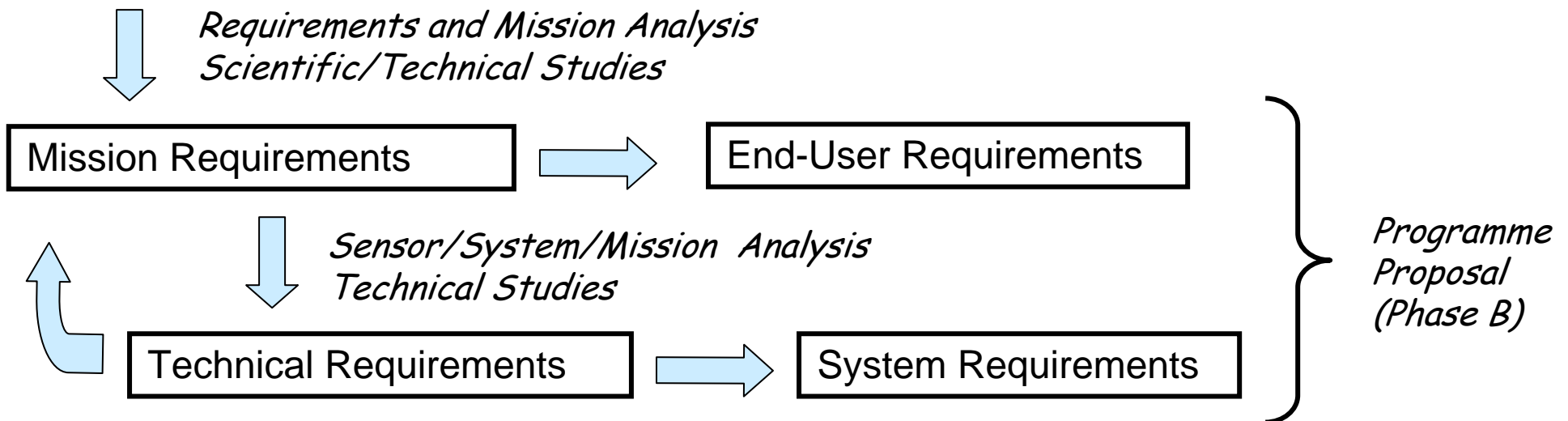
- Grouping of user requirements in candidate missions
- Definition of data levels
(raw, calibrated, resampled at satellite radiances, level 2 data, ...)
- Derivation of observation requirements
(spatial, spectral resolution, radiometric accuracy, ...)
- Identification of non-observation requirements / user services

Step 4 Technical Requirements (ESA)

- Derivation of technical requirements for sensor/system studies
(e.g. MTF, spectral response, pointing accuracy, ...)

User Requirements Definition (4)

from Phase 0
(mission definition) → to Phase A
(feasibility)



Tentative Post-EPS Missions

- Atmospheric Sounding
 - Wind Profiling
 - Ocean Imaging including Sea Ice and Surface Wind
 - Ocean Surface Topography
 - Cloud, Precipitation and Large-Scale Land Surface Imaging
 - Atmospheric Chemistry
- + Climate Monitoring (to be supported within above missions)

On Requirement Metrics

- Objective:
 - Observation goal, above which no substantial further benefit can be expected
- Threshold:
 - Minimum requirement, below which the measurement is useless
- Breakthrough (between Threshold and Objective):
 - Level at which the measurement is expected to provide a substantial improvement in the targeted services

EXAMPLE: Accuracy Requirements for Profile of Horizontal Wind Vector

Level	Threshold (m/s)	Breakthrough (m/s)	Objective (m/s)
	Global NWP / Regional NWP / Climate Monitoring		
Lower Troposphere	5/5/5	3/2/3	1/1/2
Higher Troposphere	8/5/5	3/2/3	1/1/2
Lower Stratosphere	5/5/5	3/3/3	1/1/2
Higher Stratosphere And Mesosphere	10/-/7	5/-/5	1/-/3

Summary and Outlook

- Translation of User into Mission Requirements results in
 - Identification of candidate observation mission:
 - for instance: Doppler Wind Lidar
 - Formulation of mission (observation) requirements by dedicated analyses
 - Extrapolation from existing knowledge and instruments
 - Specific studies (e.g. simulation of impact of different realisations, ...)
 - Industrial concept studies on instruments and system architecture
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- Real measurements (ADM/Aeolus) will have decisive impact on relative importance and priority of Doppler Wind Lidar Mission in Post-EPS
 - and/or necessary enhancements of a Doppler Wind Lidar Mission
 - More info: www.eumetsat.int (all position papers and 1st P-EPS Workshop)