Overview of KOMPSAT-5 GNSS-RO data and its analysis for NWP model at KMA

Sung-Rae Chung[1], Eunhee Lee[1], Byung-il Lee[1], Woo Kyoung Lee[2], and Sungki Cho[2]

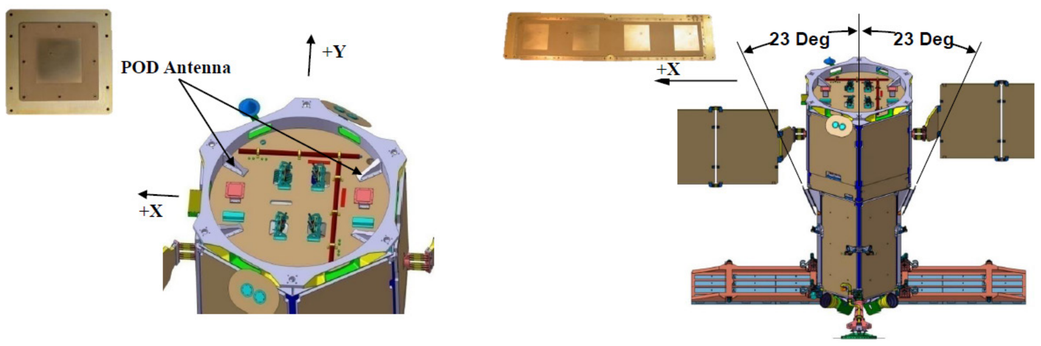
[1] *Korea Meteorological Administration, Republic of Korea*
[2] *Korea Astronomy and Space Science Institute, Republic of Korea*

Abstract

GNSS radio occultation (GNSS-RO) measurements through atmospheric occultation and precision orbit determination (AOPOD) system of KOMPSAT-5 satellite is now testing for operational use by Korea Astronomy and Space Science Institute (KASI). National Meteorological Satellite Center (NMSC) of KMA in cooperation with KASI is prepared for the acquisition and analysis system for operational numerical weather prediction (NWP) model. This study reviews the KOMPSAT-5/AOPOD system and characteristics of the GNSS-RO measurements, and shows preliminary results of its uses for KMA's NWP data assimilation.

❖ Atmospheric Occultation and Precision Orbit Determination (AOPOD) system of KOMPSAT-5

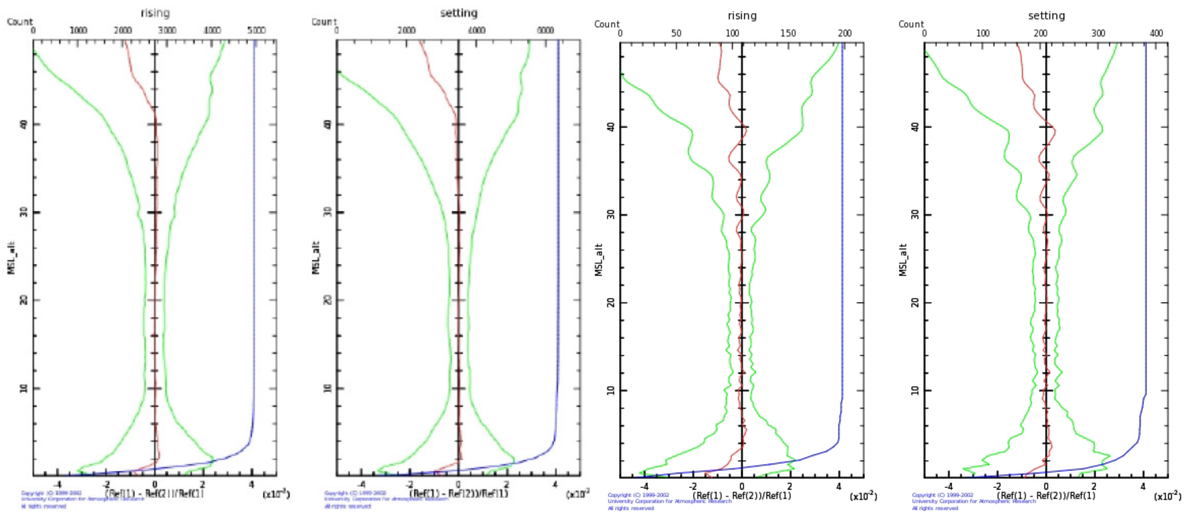
- Dual frequency GPS receiver
- 2 POD antenna and 2 occultation antenna
- Collect GPS radio occultation data which provide global atmospheric information



❖ Evaluation of KOMPSAT-5 RO data

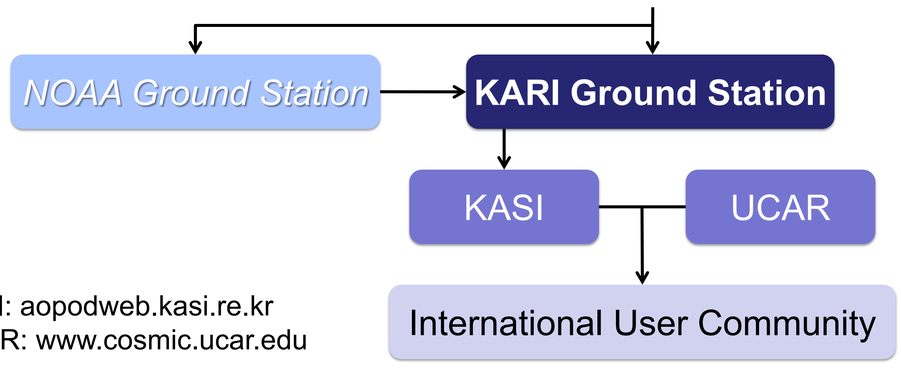
- Cooperation with UCAR COSMIC Project Office for Data processing
- More than 460 occultation event per day (AFT+FWD)
- Produce the data which have same level as the COSMIC satellite

COSMIC FM1 vs ECMWF (Aug 2013) **KOMPSAT-5 vs ECMWF (24-25, Aug 2013)**



[Courtesy of UCAR]

❖ KOMPSAT-5/AOPOD Data Service (in preparation)



- KASI: aopodweb.kasi.re.kr
- UCAR: www.cosmic.ucar.edu

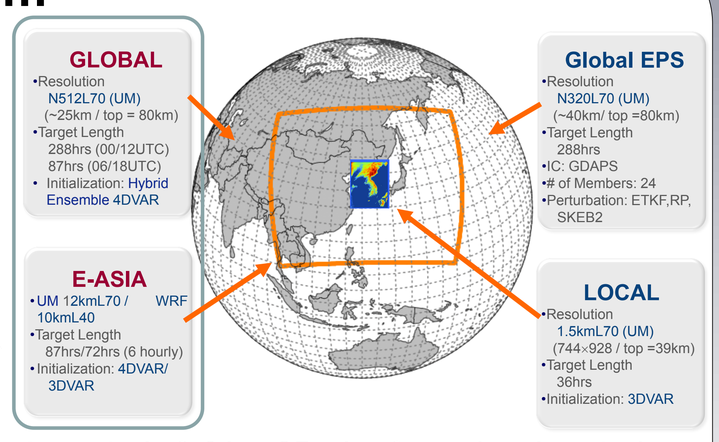
❖ KMA's NWP System

Numerical Model: UM v7.7

- **Spatial Resolution:**
  N512(≈ 25 km), L70
- **Target length:**
  252 hrs (00, 12 UTC)
  72 hrs (06,18 UTC)

Analysis Scheme: 4-DVAR

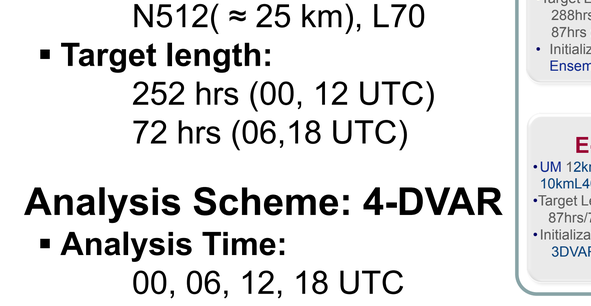
- **Analysis Time:**
  00, 06, 12, 18 UTC
- **Cut-off Time:** 2 hrs 25 mins for early analysis & 6 hrs 25 mins for updated analysis
- **Spatial Resolution (Inner Model):** N144(≈ 80km) L70
- **Assimilation Window:** -3 hrs ~ +3hrs of Analysis Time
- **Used Observation:** Synop, Ship, Buoy, Sonde, Pilot, Windprofiler, Airep, CARS (AMDAR), **AMV** (Meteosat-7, MSG-3, GOES-W/E, MTSAT-2, COMS, MODIS, AVHRR), **ATOVS** (Global, EARS, AP-RARS, SA-RARS), **ASCAT**, **IASI**(MetOp-A/B), **AIRS**, **GNSS-RO** (COSMIC, GRACE-A, GRAS-A/B), **COMS** (CSR)



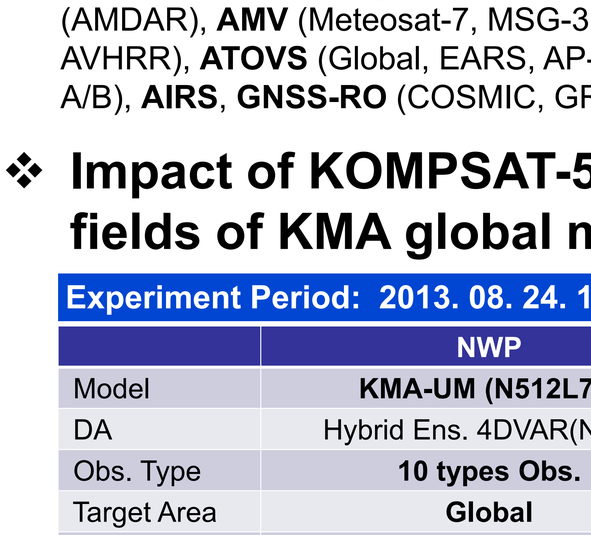
❖ Impact of KOMPSAT-5 RO data on the analysis fields of KMA global model

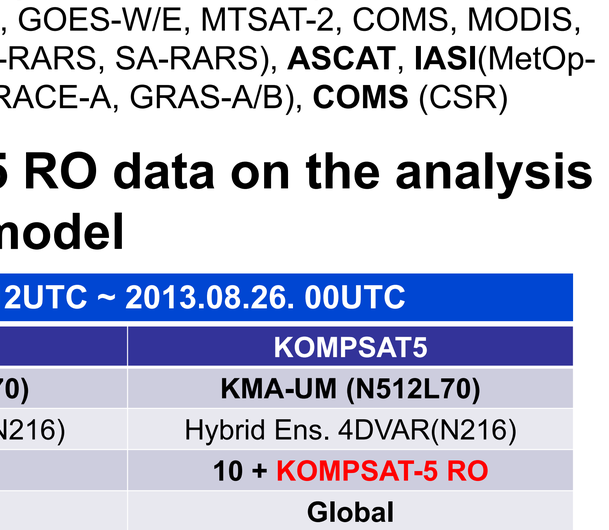
Experiment Period: 2013. 08. 24. 12UTC ~ 2013.08.26. 00UTC

	NWP	KOMPSAT5
Model	**KMA-UM (N512L70)**	**KMA-UM (N512L70)**
DA	Hybrid Ens. 4DVAR(N216)	Hybrid Ens. 4DVAR(N216)
Obs. Type	**10 types Obs.**	**10 + KOMPSAT-5 RO**
Target Area	**Global**	**Global**
Cycle	**6 hourly (early + late)**	**6 hourly (early + late)**



< **After QC (K-5 RO)** : 147 ➔ 142 points >





- Impact of KOMPSAT-5 RO data on analysis field of temperature (theta) was shown above upper troposphere at ~120E in the tropics

❖ Future Works

- Monitoring a quality of KOMPSAT-5 GNSS-RO data
- Analyzing error characteristics of GNSS-RO data for Quality Control
- Providing KOMPSAT-5 GNSS-RO data for KMA's NWP model in real-time
- Investigating an impact of KOMPSAT-5 GNSS-RO data on KMA's NWP model in real-time

❖ Reference

- Woo Kyoung Lee, 2014, Atmospheric Occultation and Precision Orbit Determination (AOPOD) system and current status of KOMPSAT-5, *The fall conference of the Korean Society of Remote Sensing*