Comparison of wind vectors derived from geostationary satellite with the Aeolus

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It is important to understand the characteristics of assimilated wind data for improving the forecast skills of NWP model.

In this study, the characteristics of the wind data are analyzed through comparison between GK2A and Aeolus/ALADIN

Satellite information

Parameter	GK2A	Aeolus
Satellite	GEO	LEO
Wavelength	0.47~ 13.3 μm	UV 354.8 nm
Resolution	IR: 2 km VIS/NIR: 1 km WV: 0.5 km	Maximum 90 km per observation
Observation time	Full disk ≤ 10 min.	06h,18h (local time)
value	u, v wind vector	Horizontal Line Of Sight (HLOS)

※ Geostationary Korea Multi Purpose Satellite-2A (GK2A)

Method

Comparison of two data by remapping
- ✓ Latitude/Longitude: 1.2 ° each
- ✓ Altitude grid: Mandatory levels

Time collocation
- ✓ Within ±15 minutes based on AMV

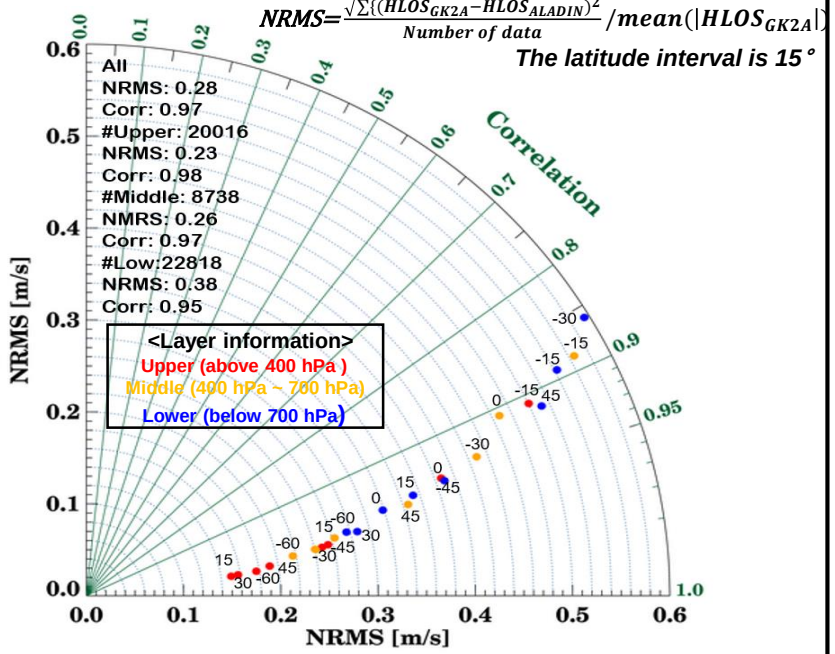
Comparison channel
- ✓ ALADIN(Mie) vs GK2A(IR,VIS,WV)
- ✓ HLOS wind is compared

Comparison of IR Channel

- ➢ Dec. 2019 ~ Feb. 2020 (NH winter)
- ➢ Correlation value
  - ✓ Upper > Middle > lower layer
- ➢ Upper, middle layer
  - ✓ The low latitude band (15S-15N) has a low correlation and high NRMS
- ➢ Lower layer
  - ✓ EQ~30S is most inconsistence

$$NRMS = \frac{\sqrt{\sum\{(HLOS_{GK2A} - HLOS_{ALADIN})^2}}{Number\ of\ data} / mean(|HLOS_{GK2A}|)$$

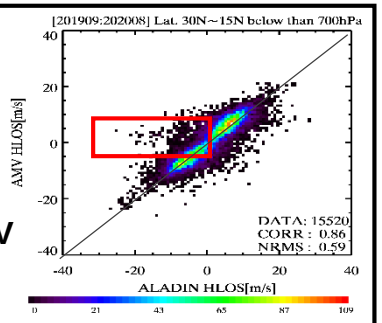
The latitude interval is 15°



- ➢ Similar results are shown in other season.
  - ✓ In the upper and middle layer the correlation is small in the low latitude.
  - ✓ In the lower layer, the correlation is small in the SH.

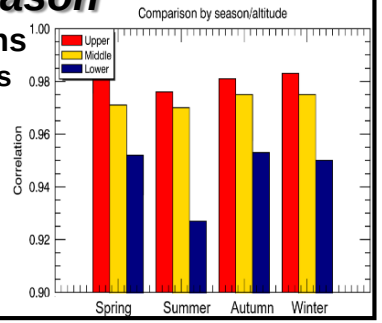
The largest difference between ALADIN and GK2A in 30S~15S Lat. band

- ➢ Sep. 2019 ~ Aug. 2020 (1 year)
- ➢ Compared to ALADIN, GK2A/AMV has smaller wind value.



Comparison according to season

- ➢ Compare all data for each seasons
  - ✓ no distinct seasonal characteristics
  - ✓ In all season, the lower layers in 15S~30S is most inconsistence
- ➢ Comparison by season/altitude
  - ✓ Inconsistence in lower layer in summer



Comparison according to channel

- ➢ WV channel (above 400 hPa)
  - ✓ Correlation: 0.97, NRMS: 0.23 m/s
  - ✓ 15S-15N has a low correlation and high NRMS
- ➢ VIS channel (below 700 hPa)
  - ✓ Correlation: 0.94, NRMS: 0.40 m/s
  - ✓ It is the most inconsistent in between EQ and 30S.

Summary

As a result of the comparison, GK2A/AMV has an error in the lower layer in SH. Therefore It is expected that ALADIN would compensate for GK2A data in the specific latitude band.