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RA II WIGOS Project Newsletter

DEVELOPING SUPPORT FOR NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES IN SATELLITE DATA, PRODUCTS AND TRAINING

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GEO-KOMPSAT-2A transition to operation

The Geo-KOMPSAT-2A (located in 128.2°E) geostationary meteorological satellite managed by the Korea Meteorological Administration (KMA) began operation at 00 UTC on 25 July 2019, continuing the COMS (Communication, Ocean and Meteorological Satellite) mission of strengthening Korea's capability to monitor the atmospheric environment over Asia-Pacific region. The Geo-KOMPSAT-2A data and images are now available through NMSC webpage (http://nmsc.kma.go.kr/enhome/html/main/main.do).

Geo-KOMPSAT-2A was launched on 4 December 2018 from the Guiana Space Center in South American at 2037 UTC. During the in-orbit test period, the capability with multi-band, high temporal and spatial resolution was verified. KMA expects that Geo-KOMPSAT-2A will contribute to monitor the weather-related disaster in its early stages over Asia-Pacific area, and will be also utilized in various fields such as climate change monitoring, hydrology and so on.

Related links:
http://nmsc.kma.go.kr/enhome/html/main/main.do

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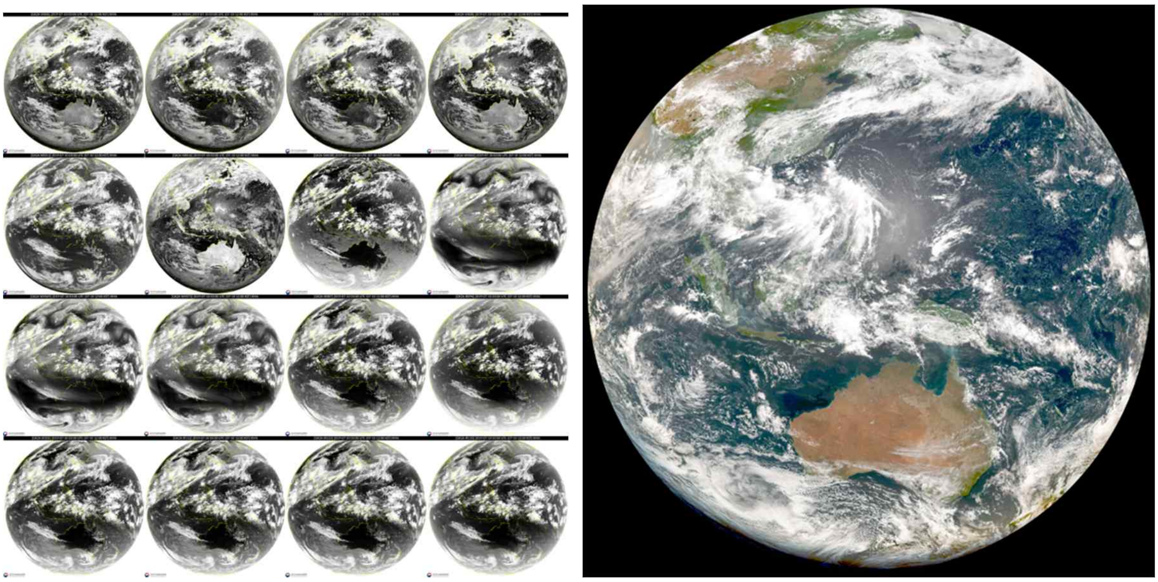

Figure 1: Full-disk true-color composite imagery from GK2A (2019. 7. 10.12:00KST)

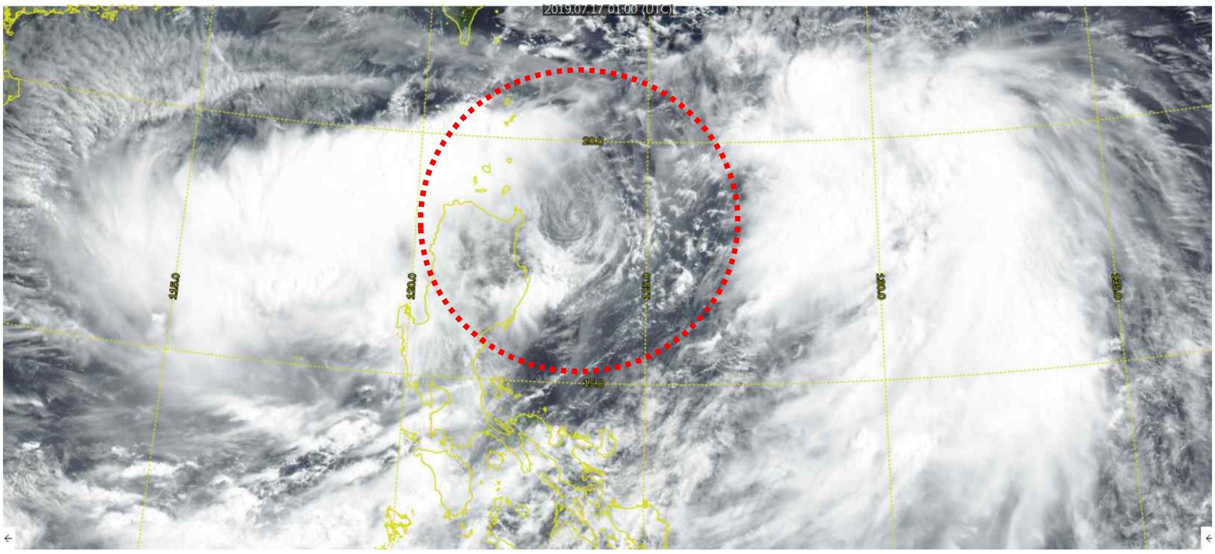

Figure 2: Typhoon Danas (TY1905) from GK2A (2019. 7. 17. 10:00 KST)

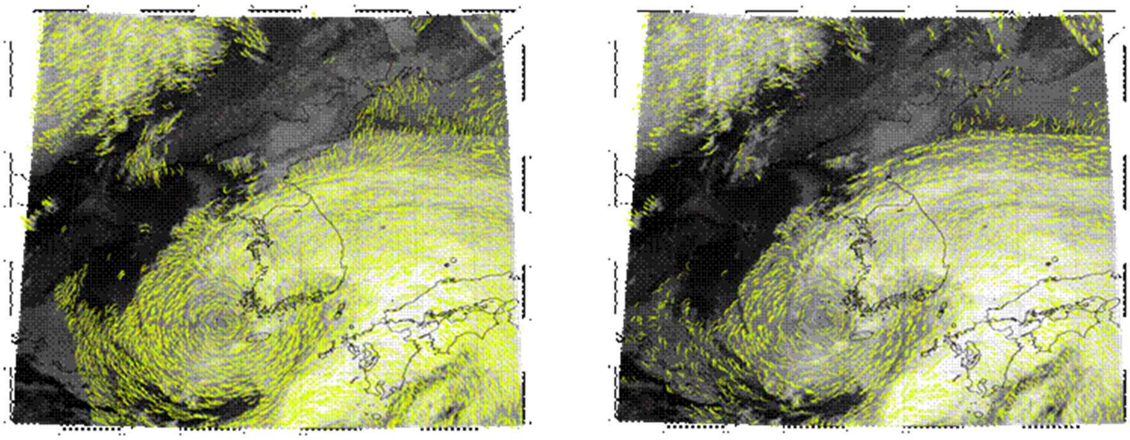

Figure 3: Atmospheric Motion Vector using 2 minute-interval observation (2019. 7. 20. 07:00 KST). Left: 0.64μm, Right 10.4μm channel.

Sea Surface Winds from Himawari-8/9

The meteorological satellite center of the Japan Meteorological Agency (JMA/MSC) has developed a method to estimate sea surface winds in the vicinity of tropical cyclones from Himawari-8/9. It is named ASWind (Atmospheric motion vector based Sea-surface Wind) which Himawari-8/9 provides every 30 minutes for full-disk observation and every 10 minutes for Target Area observation, respectively, with high accuracy for surrounding areas of strong winds (30 kt or higher) due to tropical cyclones. On 24 July 2019, ASWinds monitoring images and data in Satellite Animation and Interactive Diagnosis (SATAID) format were made available via the MSC website and the JMA Data Dissemination System (Himawari JDDS). This article reports on the results of Himawari-8 ASWinds validation against sea surface wind data derived from the ASCAT units on board EUMETSAT's Metop satellites.

To derive Himawari -8/9 AMVs, motion vectors are calculated by tracking the same target cloud patterns across three consecutive satellite images. An optimal estimation method and quality control are then applied to determine heights and filter out low-quality vectors (Shimoji 2017). Visible and infrared window satellite images are suited to the derivation of low-level AMVs. Reflection of visible radiation from lower clouds is greater than that from the ocean surface, and contrast between lower clouds and the ocean surface is sharp in visible imagery. With infrared bands, lower clouds can be identified in infrared window satellite imagery.

Figure 1 shows low-level VIS AMVs around Typhoon Ampil overlaid on a Himawari-8 VIS image. Low-level AMVs can be derived by tracking lower clouds in gaps between dense clouds around TCs, where lower clouds are frequently covered with cirrus and rapidly de-formed by strong winds or convective activity.

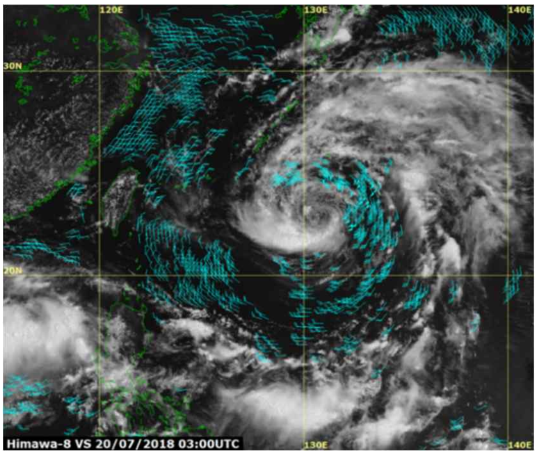

Figure 1. Himawari-8 VIS image and low-level VIS AMVs around Typhoon Ampil at 03 UTC on 20 July 2018.

Figure 2 shows the results of comparison between Himawari-8 low-level VIS AMVs and ASCAT for TCs from May to December 2015. A strong correlation is seen between low-level AMVs and ASCAT winds. It is also found that sea surface wind speeds can be estimated from low-level AMVs via multiplication by 0.76 based on linear regression analysis despite large speed differences in high winds, indicating possible overestimation of sea surface winds when a constant factor is used. Although the risk of overestimation could be suppressed by using a smaller factor for high wind speeds, a constant factor of 0.76 is initially adopted for ASWinds calculation in the interests of avoiding underestimation (Nonaka et al. 2019).

ASWinds estimated from full-disk low-level AMVs derived from three spectral bands (VIS, SWIR and IR) were compared with ASCAT winds in the vicinity of TCs occurring in 2016 (T1601 – T1626). The conditions for the matchup between ASCAT winds and ASWinds were as follows.

- Location within 1,000 km of TC centers as determined by hourly interpolation of JMA's 2016 best-track data
- Observation time difference within 15 minutes
- Selection of nearest pair located 0.05° apart or less (in longitude and latitude)

Figure 3 shows wind speed correlations of collocated data between ASCAT winds and Himawari-8 full-disk ASWinds. VIS and IR ASWinds correspond closely to ASCAT winds up to approximately 15 m/s. Table 1 shows statistics on wind speed and direction between ASWinds and ASCAT winds (ASWinds minus ASCAT winds) for each ASWind speed (every 5 m/s). The values are seen to correspond, and the root mean square (RMS) of wind speed differences is 1.2 – 1.7 m/s up to 15 m/s. The wind speed of VIS ASWinds is more consistent with ASCAT winds than that of SWIR and IR ASWinds. In regions of high wind speed (approx. > 15 m/s), RMS differences are large in terms of both wind speed and direction. Positive wind speed biases against ASCAT winds are seen in high wind speed regions in Figure 3, although the number of samples is low. A method involving the use of AMV height information to reduce these biases is currently being researched. More detailed Himawari-8/9 ASWinds data based on Target Area observation than from full-disk observation because small-scale phenomena (such as rapid changes in cloud patterns) are clarified by this higher-temporal-resolution monitoring. Use of the resulting data, which are provided every 10 minutes, has also proven effective in TC monitoring and analysis.

(Kenichi NONAKA and Akiyoshi ANDOU, JMA)

References

Nonaka, K., S. Nishimura, and Y. Igarashi, 2019: Utilization of Estimated Sea Surface Winds using Himawari-8/9 Low-level AMVs for Tropical Cyclone Analysis. *Technical Review No. 21 (April 2019), RSMC Tokyo – Typhoon Center.* [Available at https://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/techrev/text21-3.pdf.]

Shimoji, K., 2017: Introduction to the Himawari-8 Atmospheric Motion Vector Algorithm. *Meteorological Satellite Center Technical Note*, 62, 73-77. [Available at https://www.data.jma.go.jp/mscweb/technotes/msctechrep62-4.pdf.]

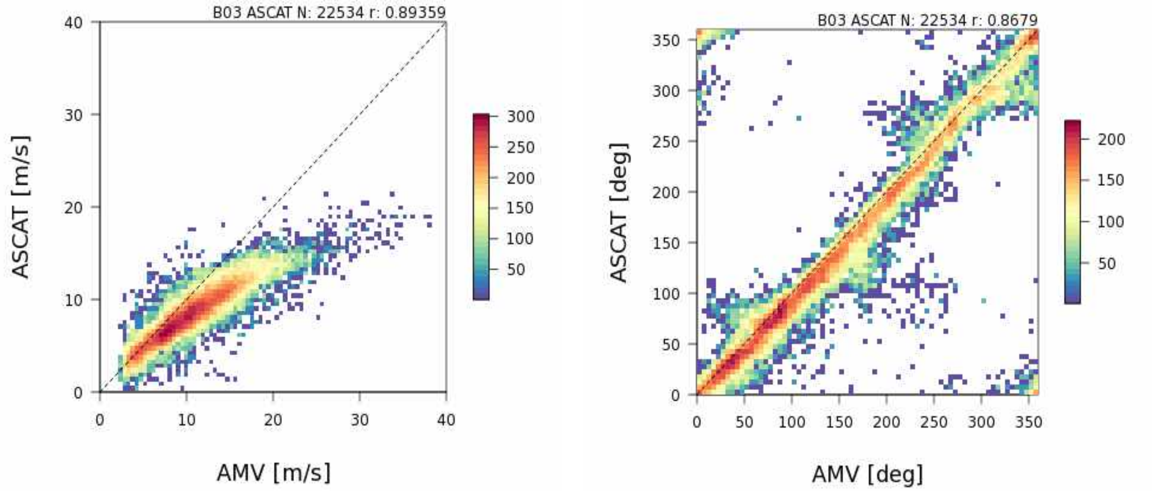

Figure 2. Comparison between Himawari-8 low-level VIS (B03) AMVs and ASCAT winds within a radius of 1,000 km from the center of TCs from May to December 2015 (left: wind speed; right: wind direction)

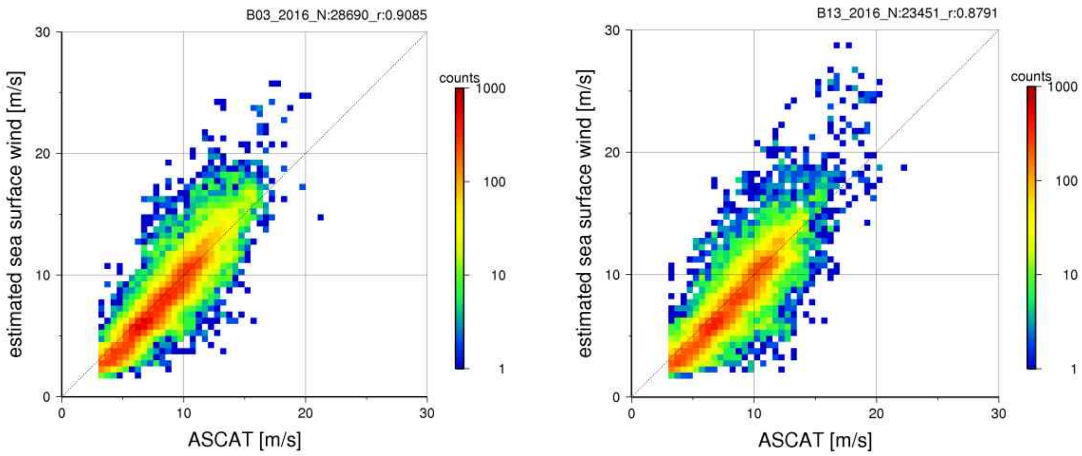

Figure 3. Speed comparison of full-disk VIS ASWinds (left) and IR ASWinds (right) with ASCAT winds. Collocation is within 1,000 km of the center of TCs forming in 2016.

Table 1. Statistics for ASWinds and ASCAT winds around TCs forming in 2016. Note that ASWind direction is not corrected from that of low-level AMVs, and bias represents the relative angle of low-level AMVs against ASCAT winds.

	N	Wind speed [m/s]		Wind direction [°]	
		RMS	Bias	RMS	Bias
B03 (> 5 m/s)	***23,015***	***1.46***	***-0.19***	***13.6***	***7.59***
0 – 5 m/s	5,675	1.41	-1.12	28.8	2.68
5 – 10 m/s	15,685	1.21	-0.64	13.5	6.27
10 – 15 m/s	6,518	1.47	0.49	12.9	9.73
15 – 20 m/s	770	3.57	2.85	18.4	15.6
> 20 m/s	42	7.15	6.83	27.3	25.2
B07 (> 5 m/s)	***20,093***	***1.66***	***-0.21***	***15.8***	***8.58***
0 – 5 m/s	5,447	1.65	-1.22	30.6	2.93
5 – 10 m/s	12,774	1.43	-0.75	15.8	6.91
10 – 15 m/s	6,618	1.53	0.45	14.6	10.5
15 – 20 m/s	598	3.71	2.82	23.4	19.9
> 20 m/s	103	7.18	6.71	29.3	28.1
B13 (> 5 m/s)	***18,233***	***1.68***	***-0.28***	***16.6***	***8.68***
0 – 5 m/s	5,218	1.67	-1.24	31.2	3.10
5 – 10 m/s	12,288	1.46	-0.78	16.8	7.30
10 – 15 m/s	5,434	1.56	0.46	15.0	10.4
15 – 20 m/s	425	4.12	3.22	25.7	22.2
> 20 m/s	86	7.56	7.15	29.1	28.0

The 10th Asia Oceania Meteorological Satellite Users Conference, Melbourne, Australia, 2-7 December 2019

The Bureau of Meteorology will be hosting the 10th Asia-Oceania Meteorological Satellite Users' Conference (AOMSUC-10) on 2-7 December 2019, in Melbourne, Australia.

The AOMSUCs have been held annually since 2010, and have been hosted by China (2010, 2014), Japan (2011, 2015), Korea (2012, 2016), Australia (2013), Russia (2017) and Indonesia (2018).

In June 2016 the Permanent Representatives of Australia, China, India, Indonesia, Japan, Russian Federation and the Republic of Korea, together with the Secretary-General of WMO, signed the Memorandum on the Asia-Oceania Meteorological Satellite Users Conference (AOMSUC) during the sixty-eighth session of the WMO Executive Council in Geneva.

The 2016 Memorandum formalises the AOMSUC as a permanent mechanism for facilitating dialogue and improved collaboration among the satellite providers and user communities of the Asia-Oceania region, and for enhancing the use of satellites for weather, climate and disaster mitigation services.

AOMSUCs have proved to be very effective in:

- promoting satellite observations and advancing application areas with a focus on regional issues;
- informing on recent advances in remote sensing science;
- fostering the dialogue between satellite operators and the user community on current and future satellites; and
- engaging young scientists.

The AOMSUCs feature high quality oral and poster presentations, as well as panel discussions that address topical issues such as utilisation of satellite data in Weather Analysis and Forecasting, Climate and Environmental Monitoring, and Numerical Weather Prediction and Disaster Monitoring. As satellite capabilities continue to evolve, and data from new generation satellites become available, it is important that the community continues to exchange information and expertise on satellite science, usage and training.

AOMSUC-10 will comprise three events:

1. Training event on satellite data utilisation (2-3 December 2019);
2. Plenary session (4-6 December 2019);
3. RA-II / RA-V Joint meeting (7 December 2019).

The Bureau of Meteorology is committed to diversity and inclusion and encourages diversity of conference presenters and participants.

For more information on the conference please email: aomsuc10@bom.gov.au

(Agnes Lane, AUBOM)

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From the Co-editors

The co-editors invite contributions to the newsletter. Although it is assumed that the major contributors for the time being will be satellite operators, we also welcome articles (short contributions of less than a page are fine) from all RA II Members, regardless of whether they are registered with the WMO Secretariat as members of the WIGOS Project Coordinating Group. We look forward to receiving your contributions to the newsletter.
(Dohyeong KIM, KMA, and Kotaro BESSHO, JMA)

RA II WIGOS Project Home Page

http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro_en_jma.Html

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