Introduction. The Ocean Biology Processing Group has been working with the Korean Institute of Ocean Science and Technology (KIOST) to process geosynchronous ocean color data from the GOCI (Geostationary Ocean Color Instrument) aboard the COMS (Communications, Ocean and Meteorological Satellite). The level-2 processing program, l2gen has GOCI processing as an option. Improvements made to that processing are discussed here as well as a discussion about cloud motion effects.

Level-2 processing improvements: Metadata interpretation – The GOCI L1B metadata was not being interpreted correctly and was repaired.

Slot times were used to generate solar geometry – this improved atmospheric correction and stabilized many ocean color parameters through the day (see Rrs plots, Fig 2).

Residual gradients were seen and characterized in the GOCI ‘Slots’

Current GOCI images contain a residual uncorrected gradient in the slots used to make up a complete scene. The gradient is shown in Figure 3 by binning the aerosol optical thickness at 865 nm (AOT) in slot coordinates for all the slots in the for 14 Aug 2012 scene (16 slots per scene/time and 8 scenes, 128 slots total). Figure 4 shows the AOT gradient clearly, rising toward the bottom of the slot. KIOST is developing a correction for this gradient (Kim et al., 2015).

Cloud motion Effects in GOCI

In the time it takes for the GOCI instrument to step through all the filter positions for the 8 bands, clouds in the scene can move by more than the detector size of 500 m. This was also noted by Fukushima et al., 2015. Table 1 shows the relative times that bands are acquired for the 4 June, 2015 scene examined here (note that time delays may be adjusted through the mission to compensate for detector degradation).

Cloud motion – 4 June 2015 case

The true color image of the noon (0300) time (Figure 5), if looked at in detail at point A (Figure 6), shows the effect of cloud motion. The bands used traditionally to make the true color (Fig 6) have a maximum 36 second delay between the bands used. Only a slight ghosting effect is seen. However, if the green portion of the true color image was made instead with the 490 nm band, the cloud shift caused by a 52 second delay is quite evident (Figure 7)

Impact of moving features on satellite measurements

Any instrument that sequentially acquires band data can be examined to determine the maximum time allowable before the motion of a feature will need to be considered. For GOCI, with a detector size of 500 meters and which takes 52 seconds to acquire all 8 bands, cloud motion of less than the detector size will happen only for clouds moving at 20 kt or less. As the maximum wind speed seen in the atmosphere is 220 kt, GOCI would have to acquire all 8 bands in under 4.5 seconds to keep cloud motion to under 1 pixel. The shift in Fig 9 graphically shows this relationship for a range of detector sizes and feature speeds.

Summary

- Metadata use in level-2 processing was improved.
- Slot times were introduced into processing with greatly improved diurnal stability of ocean color parameters.
- An uncorrected gradient in slots was found.
- Cloud motion needs to be considered for GOCI, possibly other ocean color instruments.
- Time to acquire all bands for a location needs to be short enough to avoid cloud motion between bands.
- If time is large, inter-band correlations and cloud mask shifting can be used to properly mask other bands.
- Cloud wind speeds can be determined from band shifts if the time is large enough.
- GOCI appears to have little jitter (detector motion) between bands.

References

