NOAA ROSES Semi-Annual Report

Reporting Period: September 2021 – March 2022 (3rd report)

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Project Title: GeoRing-ProxyVisible Satellite Imagery: Turning Night into Day with Machine Learning

Executive Summary

Visible satellite imagery is routinely and widely used by operational forecast centers for marine, tropical and extratropical cyclone analysis and forecasting [e.g., at National Hurricane Center (NHC), Central Pacific Hurricane Center (CPHC), Ocean Prediction Center (OPC), Weather Prediction Center (WPC), Joint Typhoon Warning Center (JTWC)]. This project's goal is to develop the new geostationary satellite product Geo-Ring ProxyVisible Imagery (GRPV) to address the lack of nighttime visible imagery by replicating visible imagery at night-time using advanced machine learning techniques. GRPV will work with multiple next generation geostationary satellites including GOES-16, GOES-17, Himawari, and Geo-KOMPSAT-2A. The project team will work closely with NHC forecasters and use feedback for product development. GRPV will be made available in real-time for NHC's Advanced Weather Interactive Processing System (AWIPS2), and online for operational forecaster's evaluation and feedback.

Progress toward FY20 Milestones and Relevant Findings (with any Figs)

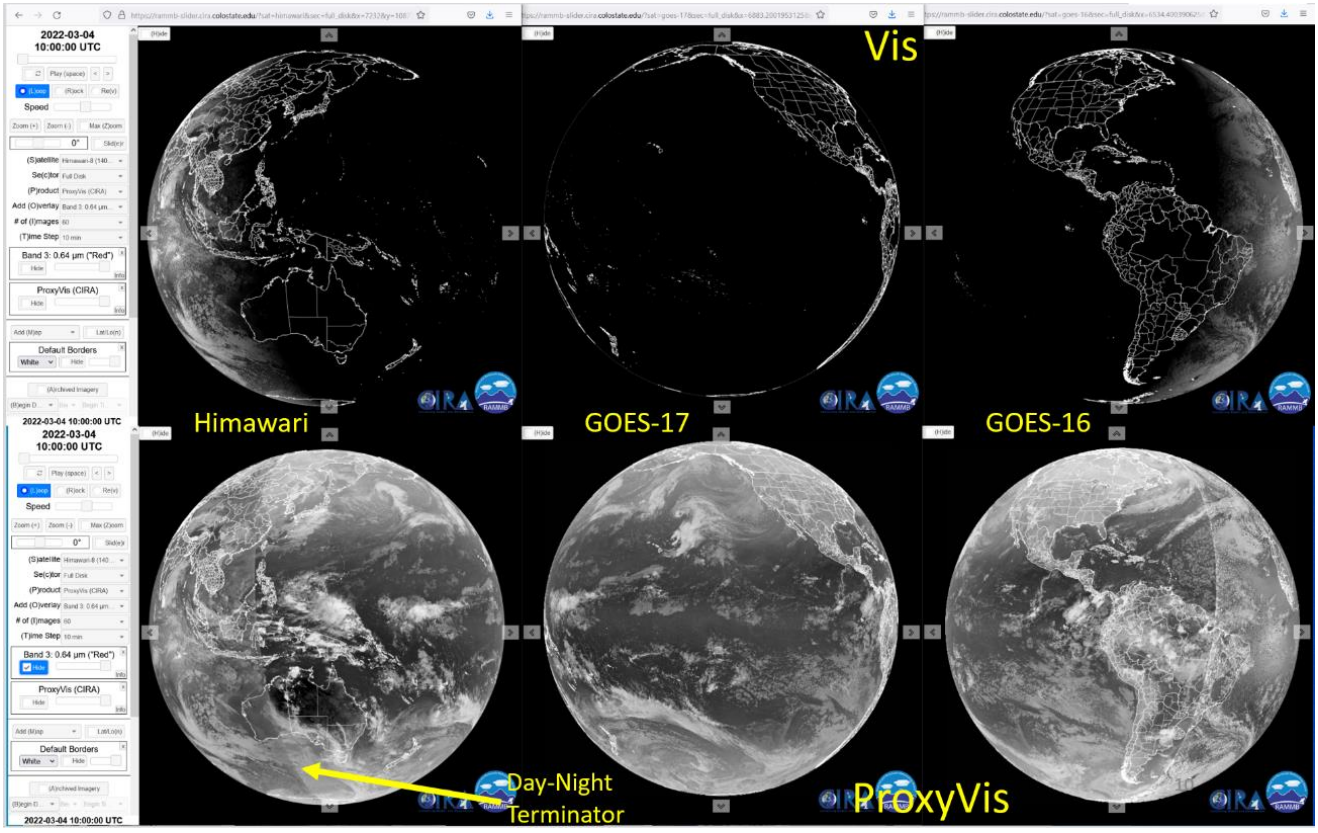
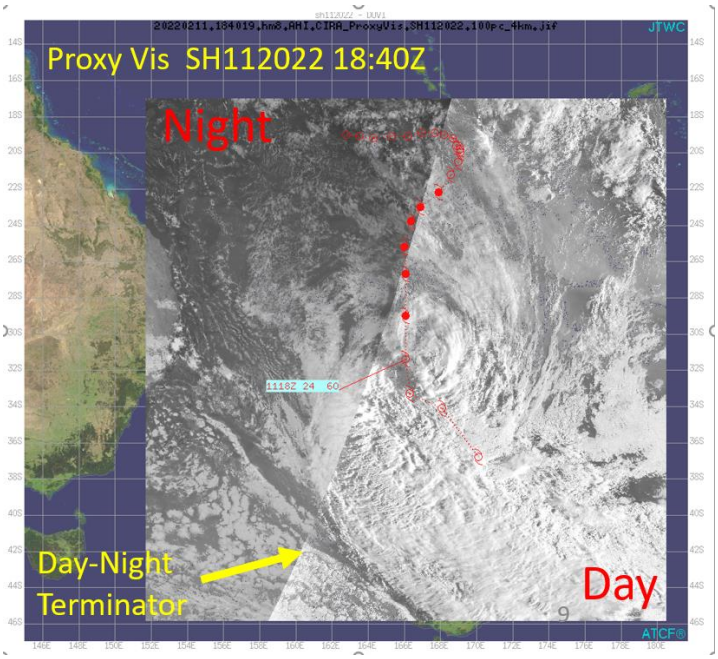


Figure 1. ProxyVis on RAMMB-CIRA SLIDER. Upper row: Visible imagery. Lower row: ProxyVis imagery. ProxyVis is available on SLUDER for GOES-16, GOES-17, and Himawari. Work is in progress on implementing on SLIDER ProxyVis for Meteosat-8 and Meteosat-11 satellites.

During this reporting period the focus was on setting up machine learning training framework, expanding processing to work with multiple geostationary satellites, and coordination with operational partners on future product demonstrations. The most significant accomplishments include:

1) The existing processing was expanded to generate ProxyVis imagery for Himawari and readers have been developed for Meteosat-8 and Meteosat-11. In addition, the ProxyVis for Himawari has been implemented in real-time on RAMMB-CIRA SLIDER (https://rammb-slider.cira.colostate.edu/). Work is in progress on implementing on SLIDER ProxyVis for Meteosat-8 and Meteosat-11. Figure 1 shows an example of ProxyVis for Himawari, GOES-17, and GOES-16 on SLIDER.
2) The code for generating ProxyVis imagery for Himawari, GOES-16, and GOES-17 was implemented in GeoIPS in coordination with NRL. This will be used to provide to JTWC both current ProxyVis and updated GRPV imagery for demonstration. NRL further used ProxyVis generated via GeoIPS to implement ProxyVis in the Automated Tropical Cyclone Forecasting System (ATCF). The storm-centric ProxyVis imagery is now operational in ATCF. The storm-centric images are generated every 30-minutes and provided to all ATCF users, including NHC, CPHC, and JTWC. Figure 2 shows an example of ProxyVis imagery in ATCF.



3) We developed AWIPS2 SatPy-based tiles for Himawari and working on adapting these to work with GOES-16 and GOES-17. This will be used to demonstrate multiple versions of ProxyVis imagery in forecaster's environment in AWIPS2 to NHC and JTWC. Figure 4 shows an example of Himawari ProxyVis image displayed in AWIPS2 at CIRA using our new code.

Figure 2. ProxyVis in ATCF. ProxyVis is now operational in ATCF and available for the areas covered by GOES-16, GOES-17, and Himawari for all operational centers that use ATCF, including NHC, CPHC, and JTWC.

Plans for Next Reporting Period

During the next report period we will continue developing the GRPV algorithm and coordinating with operational users on future product demonstrations.

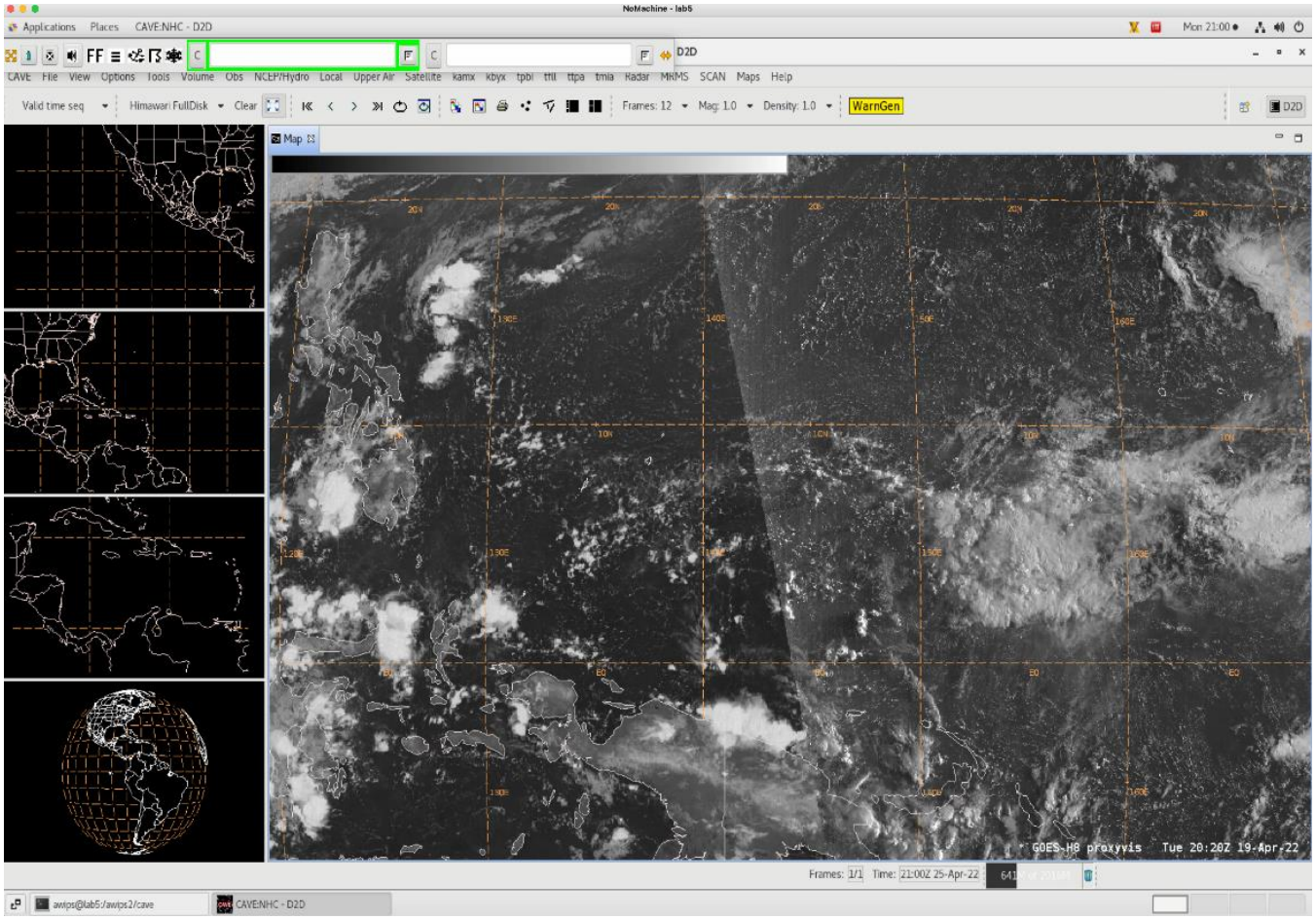


Figure 3. Example of Himawari ProxyVis imagery in AWIPS2 using our new SatPy-based processing.