

Advanced Infrared Sounding System for Future Geostationary Satellites

**Timothy J. Schmit, Jun Li, James J. Gurka, Jaime Daniels,
Mitch Goldberg**

The United States Geostationary Operational Environmental Satellite (GOES) Sounders (GOES-8/9/10/11/12) have provided hourly infrared (IR) radiances and derived products over the continental U.S. (CONUS) and adjacent oceans for over 14 years. The GOES-10 sounder now also provides hourly coverage over South America. The products derived include: clear-sky radiances; temperature and moisture profiles; Total Precipitable Water vapor (TPW) and layer PW; atmospheric stability indices such as Convective Available Potential Energy (CAPE), Lifted Index (LI) and K-Index; cloud-top properties; water vapor motion winds through radiance tracking; and total column ozone. These products are used in numerical weather prediction (NWP), short range forecasts and nowcasts, including severe weather forecasts. While broadband geo-sounding has proven useful, hyperspectral IR sounding will provide measurements that serve user requirements much better. Developing a GOES IR sounding capability with high temporal, spatial, and spectral resolutions is very important for supporting regional and convective-scale NWP over CONUS, as it will provide unprecedented detail on 3D fields of wind, temperature, and humidity. Nowcasting and very-short range forecasting (VSRF) will also benefit from these 3D fields from the monitoring of moisture convergence and convective instability and improving warnings of location and intensity of convective storms. The combination of high spectral and temporal resolution will allow resolving the critical low-level moisture. Studies with available aircraft and satellite data have demonstrated the importance of geostationary hyperspectral IR radiances and products on severe storm forecasts. The benefits of a spaceflight demonstration in parallel with any operational program would be enormous.

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