



Satellite remote sensing: A cornerstone of modern environmental information for climate monitoring

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Satellite remote sensing (SRS) provides unique tools and methods for global and regional monitoring of the natural environment including the Earth atmosphere, oceanic and terrestrial surfaces. Do existing environmental data meet modern environmental information priorities? Are there any gaps in the current state of the environmental information? What may be potentials for improving our existing capabilities? In this paper, we present our view on emerging SRS techniques - GPS Radio Occultation (RO) and GPS Reflectometry, with particular focus on their potential benefits for global and regional monitoring of the atmosphere, oceans and investigations of tropical cyclones.

High-quality temperature measurements in the upper troposphere/lower stratosphere can be obtained using GPS RO. We demonstrated in a number of studies that GPS RO technique brings significant benefits for climate monitoring – globally and regionally (e.g. the Australian region, the Antarctic etc). As GPS RO data provide global coverage, all-weather capability and long-term measurement stability, this SRS technique can potentially serve as climate benchmark for detecting temperature changes in the Earth's atmosphere. However, accuracy of GPS RO methodology for retrieving temperature and moisture profiles in the lower troposphere requires improvement.

Tropical cyclones are the most damaging severe weather events which dramatically affect coastal communities in the tropics. Their global and regional frequencies and intensities may change in the warming world and accurate information about cyclone characteristics obtained by modern SRS methods is of high importance. Advancing an emerging SRS technique – GPS Reflectometry – we developed analytical models of radiowave reflection from the oceanic surface demonstrating significant potential benefits for oceanography and meteorology through obtaining information about waves, near-surface wind speed and direction, and tropical cyclone investigations (estimating cyclone intensity).

Further advancements in GPS RO and GPS Reflectometry could be an important avenue for consolidated international efforts to better satisfy needs of meteorology and climatology for this vital environmental information.

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