

Monitoring the Global Climate Change and the Regional Tropical Climatic Hazards in Asia Oceania from Space

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Climate change and its associated hazards such as tropical cyclones, drought, extreme heat and bushfires are serious problems faced by Australia. Low density of the ground-based meteorological observation stations (especially in the Southern Hemisphere) and the lack of accurate data over the world's oceans and the Polar regions have limited the accuracy and reliability of the current climate models. As such it is important to develop and evaluate new observational techniques to gain an improved understanding of climate change in the Asia Oceania region. Satellite-based remote sensing provides a powerful means of precise measurements of the characteristics of the Earth environment on a global scale.

As an emerging approach of atmospheric remote sensing, the Global Navigation Satellite Systems (GNSS) Radio Occultation (RO), has proven to be an important and robust atmospheric sounding technique of retrieving high accuracy and high vertical resolution meteorological information with an un-biased and unprecedented global coverage, availability over difficult-to-access areas and operation under all all-weather conditions. The GNSS RO data can be used to improve the absolute accuracy of temperature analyses based on other space-based observations and the modeling process of the troposphere, stratosphere and ionosphere.

Recently, the Australian Government launched the Australian Space Research Program (ASRP) and supported the "Platform Technologies for Space, Atmosphere and Climate" project. Under this project, advanced algorithms and optimised methodologies will be developed in order to improve the use and accuracy of GNSS RO data from the Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) mission and consequently to improve the analysis of key atmospheric characteristics such as temperature and moisture. Improved algorithms

and methodologies will be developed with a view to be also implemented for data retrieval from the planned new satellite missions across the globe (e.g. KOMPSAT-5 from Korea, COSMIC-II from Taiwan/USA, radio occultation sounder for atmosphere from Italy and others) and possible future Australian geo-environmental satellites.

A new multi-sensor satellite remote sensing/data assimilation approach for extending predictability in numerical weather prediction, climate and tropical cyclone investigations will be developed to estimate winds from visible and infrared observations from the geostationary meteorological satellites and active and passive microwave observations from polar-orbiting satellites, determination of temperature and moisture from NOAA, EUMETSAT and NASA's advanced infra-red and microwave sounding systems. These satellite-derived atmospheric soundings data used in conjunction with GNSS RO data will allow us to establish high-accuracy climate monitoring platforms.

In summary, a suite of satellite-based technology platforms will be developed for the purposes of space tracking, precise positioning, space, atmosphere and climate related research which will be an important step forward in advancing our understanding of the global climate change as well as the regional tropical climatic hazards in Asia Oceania. The recently awarded ASRP project will be introduced and major research work will be outlined.

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