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Atmospheric Remote Sensing for Meteorology in Southern Hemisphere and Antarctica -Recent Australian Initiatives

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Recent developments in both ground-based and space-borne geospatial infrastructure have opened exciting opportunities for geodesists to contribute to "big issues" such as atmosphere, climate changes, global warming, and environmental sustainability. GNSS atmospheric remote sensing using GNSS and low Earth orbit (LEO) satellites such as CHAMP, GRACE and COSMIC is a new technique for profiling the atmosphere. Research has demonstrated that GNSS radio occultation technique is capable of measuring the Earth's atmospheric parameters with a high accuracy, unprecedented high resolution and global coverage. It is expected that this new technology will significantly advance our knowledge of Earth's atmospheric structure and processes.

Australia and Antarctica are characterized with a large continent, sparse population and a long coastline. The lack of variety and density of reliable meteorological observations over Australia and Antarctica poses a major challenge for operational weather prediction, long term climate studies, and optimal usages of satellite data. Since the successful launch of the six COSMIC satellites in April 2006, approximately 2,500 global daily GPS radio occultation events (ROEs) and over 100 daily GPS ROEs in Australia have been obtained which represents six times more observations in comparison with CHAMP. Such a large number of retrievals have brought unprecedented opportunities for in-depth regional studies and operational usage of the GNSS RO retrievals in southern hemisphere. The planned new launches in the next a few years from South America, Europe and Asia are offering exciting opportunities for geodesists to tackle big issues such as climate and environment globally.

Recent significant Australian research initiatives along the GNSS positioning, meteorology/climate and space debris tracking will be outlined. We start with a brief introduction of the SPACE Research Centre established at RMIT University including key research directions and projects, and recent international collaborations, particularly in the areas of GNSS atmospheric sounding, weather and climate. The recent Australian government initiative of its space research program scheme will be then outlined. The multiple million dollars space research project in the areas of in-space tracking and navigation, precise satellite positioning, space weather, atmospheric modelling and climate monitoring awarded to a research consortium led by SPACE will be introduced. Key issues related to the research work and challenges confronting Australian space research and space industry will be discussed and some preliminary outcomes will be shown to facilitate discussion and possible international collaboration in atmospheric remote sensing, GNSS and geodesy.