## Determining the Australian Climate Using an Enhanced Space-based Observation Data Set and Conventional Meteorological Observations

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The characterisation of the Australian climate over the past five decades can be improved through the use of space-based observations and conventional meteorological data. This requires a focused effort to assemble a high resolution database based on space-based observations and appropriate conventional data which can be used to provide a detailed analysis of conditions over Australia. These sources of data can subsequently be used in conjunction with conventional observations in a high quality re-analysis of climatological conditions over Australia over past decades using 21st century state of the art analysis methodologies. Key components of the state of the art database which needs to be assembled include space-based wind observations from high resolution geostationary satellites, emissivity fields which will allow accurate estimates of surface temperatures within the state, soil moisture fields which provide an important source of information for hydrology, reanalysis and for activities like crop estimation and GPS radio occultation (RO) data which will allow the estimation of temperature and moisture and provide a climate baseline for any reanalysis. These particular data sets represent a new and important observational capability. This establishment of a space based and conventional high resolution database for Australia represents the first step in the generation of a high resolution accurate re-analysis of the Australian climate over the past five decades.

Part of this enhanced database is high spatio-temporal resolution atmospheric winds which can be determined by tracing cloud and water vapour elements in the atmosphere using space-based observations [1]. An improved climatology of winds over Australia can be resulted from an analysis of these data and additional synoptic data which have not been incorporated in previous studies. The importance of accurate wind climatology will affect many activities including the citing of wind farms in the country. Australia has significant expertise in the generation of these winds and there are now additional historic satellite data available [2] which will allow the wind observations to be extended back over a larger period of time.

In relation to the determination of surface temperatures over the state of Victoria, one missing ingredient has been very accurate knowledge of surface emissivity. In recent years a new generation of space-based instrument has being flown and these allow the separation of emissivity and surface temperature. Data from these instruments needs to be analysed to produce high resolution climatology of emissivity for Australia. These data can then be used with a variety of space-based window channel observations from a number of space-based instruments to produce surface temperature fields. These are an important part of a basic climatology and have great influence on determining parameters like soil moisture and crop production.

The third important component of the database required for high-resolution Australian climatology is soil moisture. While there are a number of ground-based observations these are not sufficient to characterise the state at an appropriate spatial and/or temporal resolution. Recent satellite instruments (such as AMSR(E) and WindSat) have provided new observations for determining this field and in the coming years new satellites dedicated to measuring soil moisture will be launched. Incorporation of these data into climatology of Australia both retrospectively and into the future is a very important activity and this project will take the first step of assembling this data and examine its incorporation into the climatology.

Another essential component of this climatology is to assemble GPS RO data and use these data to improve the analysis of temperature and moisture fields over Australia. GPS RO data will be used not only to produce better space-based estimates of temperature and moisture but can also be used to help improve the absolute accuracy of temperature analyses based on other space-based observations.

Overall this project is the first important step in providing Australia with a space based database suitable for generating a world-class high resolution analysis of climate over recent decades. This is of great benefit in understanding the current status and trends in climate and will be of great assistance in planning in a climate change regime.

## References

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