



SCOSTEP Distinguished Young Scientist Award 2016 – Dr. Brett Anthony Carter

*Dr. Brett Anthony Carter from the Space Research Centre, RMIT University, Melbourne, Australia is the recipient of the SCOSTEP **Distinguished Young Scientist Award** for 2016 for his innovative approach in the study of the occurrence of equatorial plasma bubbles (EPBs) and of geomagnetically induced currents (GICs) producing results of considerable importance for the understanding of the origin and manifestation of these phenomena.*

Dr Brett Carter has made significant advances in two important areas in solar-terrestrial physics; (1) the occurrence of equatorial plasma bubbles (EPBs), which affect trans-ionospheric radio communications and navigation signals, and (2) geomagnetically induced currents (GICs) at equatorial latitudes. The problem of EPBs has been a hot research topic for decades in ionospheric physics, and has become an even more important issue now that society relies so heavily upon space-based navigation and timing signals, such as those from the Global Positioning System (GPS) satellites.

Dr Carter demonstrated that a global coupled thermosphere-ionosphere physics-based model replicated, to a high degree, the observed daily variability in the occurrence of GPS scintillation events (i.e. EPBs) at multiple locations around the world. He further found that small changes in geomagnetic activity were a main driver of daily EPB variability. His findings have significantly contributed towards successful prediction of the occurrence and properties of EPBs on a daily basis, an achievement the field has been striving towards for decades. The new EPB prediction capability that Dr Carter has developed requires no ground infrastructure, but only data from the ACE/WIND spacecraft upstream in the solar wind. He is currently working on translating this research finding into an operational product that will distribute GPS and VHF/UHF scintillation forecasts for users around the world.

The second topic that Dr Carter has significantly advanced through his research is GICs at equatorial latitudes, another hot topic in the field of solar-terrestrial physics. In this research area, he made two profound and important discoveries: (1) he confirmed that the equatorial electrojet effectively amplifies the magnetic field signatures of interplanetary shock arrivals, and (2) that these amplifications occur under both disturbed and quiet geomagnetic conditions. The former finding has significant implications for nations located at the magnetic equator whose electrical power grids would not have been designed to cope with adverse space weather conditions. The latter finding has much broader implications and it has led to the realization that GICs are not only a problem during severe geomagnetic disturbances, but also during quiet geomagnetic conditions.

Dr Carter's work on GICs at the equator has received global media attention, which has once again focused upon the area of solar-terrestrial physics, and on the societal impact of space weather more generally. His work on this was published in August 2015 in the *Geophysical Research Letters* has already received very considerable positive attention from within the scientific community, being highlighted as one of the top 10 papers on GICs in the last 55 years and is very likely to become known as one of the seminal papers in this field. Dr Brett Carter has published a total of 19 refereed publications (10 as first author), 5 scholarly book chapters, and 12 refereed conference proceedings papers. His works have been cited more than 100 times, and 60 of those citations have occurred within the last 2 years. His presentation on EPBs at the 14th Ionospheric Effects Symposium in Alexandria, VA, USA won him the Young Scientist Best Paper Award.

In addition to his scientific contributions to solar-terrestrial physics, Dr Carter has an active online presence in a scientific outreach capacity that includes 6 science media articles published on solar-terrestrial physics and space weather topics with more than 150,000 readers around the world. Dr Brett Carter is a rising young scientist that has demonstrated excellent potential in his short career to date.