



## SCOSTEP Distinguished Young Scientist Award 2014 – Dr. Jia Yue

Dr. Jia Yue of Hampton University is the recipient of the SCOSTEP *Distinguished Young Scientist Award* for 2014 for his significant contribution to solar-terrestrial physics through his study of vertical coupling by atmospheric waves between the troposphere and the upper atmosphere.

Dr. Jia Yue's work deals with the broad topic of atmospheric waves and their variability in the mesosphere, thermosphere and ionosphere. He has utilized experimental techniques including both passive and active optical remote sensing from ground-based narrowband sodium temperature-wind lidars and all-sky airglow imagers, as well as satellite-borne instruments such as the TIMED/SABER, AIM, Aura, Suomi NPP etc. He also performed theoretical simulations of the mesosphere, thermosphere and ionosphere using general circulation models such as the NCAR/TIME-GCM.

Dr. Yue's investigations have encompassed the full range of wave phenomena including gravity waves, tides and planetary waves. His first major contribution was the discovery that concentric gravity waves are routinely produced by tropospheric convective activity. Although isolated observations of concentric gravity waves had been reported in the past, Dr. Yue's breakthrough was to systematically compile a database of these waves from 6 years of airglow imagery in Colorado and then characterize these waves by comparing with tropospheric radar charts and satellite images. He also collaborated with scientists to model these waves, and clarified the mechanisms by which these concentric waves are generated and propagate into the thermosphere. Such concentric gravity waves are now more commonly observed with satellite imaging (e.g. ISS/IMAP, Suomi NPP etc.) and ground based imager networks, as the number of researchers involved in this research field is rapidly increasing. Dr. Yue himself has recently shown these waves to reveal themselves in ice cloud imagery acquired by the CIPS instrument on the NASA/AIM satellite.

Subsequent to his initial work on gravity waves, Dr. Yue has made contributions also in tidal and planetary wave studies. Using both satellite and model results, Dr. Yue mapped out the global distribution of the migrating terdiurnal tide and linked its morphology to the (3,3) Hough normal mode. Most recently Dr. Yue has become interested in the quasi two-day planetary wave and his work has contributed to a recent explosion of interest in this topic amongst aeronomers. Using simulations with the TIMEGCM, Dr. Yue has shown that this wave, previously understood to be primarily a mesospheric phenomenon, can propagate into the thermosphere and ionosphere, ultimately modulating the peak F2 region electron density. He has also shown how this wave may contribute to the rapid transport of exhaust plumes from the space shuttle. Taken together, these studies and publications on gravity waves, tides and planetary waves represent a prodigious research output, covering the entire range of middle and upper atmospheric dynamical variability.

With over 70 citations in 2013 alone (Web of Science database), Dr. Yue's work has made an immediate and important impact on the aeronomic community. The focus of his work relates to the topic of "What is the geospace response to variable inputs from the lower atmosphere?" (TG4) of SCOSTEP's Climate and Weather of the Sun-Earth System (CAWSES-II) program (2009-2013) and is highly relevant to the ROSMIC "Coupling by Dynamics" Working Group (Working Group 2) of the VarSITI (Variability of the Sun and its Terrestrial Impact) program (2014-2018). Dr. Yue has shown that concentric gravity waves are not rare, but rather are common phenomena associated with deep convection in the troposphere. As a result of his

work and publications, various studies on strong vertical coupling due to such gravity waves are now being carried out more extensively by the aeronomy community utilizing both ground-based and satellite observations, theoretical works and modeling. Since gravity waves are one of the primary ways in which momentum is transferred vertically in the earth's atmosphere, Dr. Yue's work is directly relevant to the improvement of whole atmosphere modeling. In addition to his immediate research Dr. Jia Yue is very active in organizing collaborations with many researchers from the Solar-Terrestrial Physics community, especially with scientists in the USA and Asia (e.g. China (both main land and Taiwan) and Japan).

Dr. Jia Yue's accomplishments as a young scientist indicate a potential for him to become a very visible international presence representing SCOSTEP science.