SCOSTEP Distinguished Young Scientist Award 2014 – Dr. Neel Savani

Dr. Neel Savani of the Naval Research Laboratory is the recipient of SCOSTEP's ***Distinguished Young Scientist Award*** for 2014 in recognition of his innovative research and prolific publication record on solar-terrestrial physics in the first four years of his career.

Dr. Savani's research interests focus on the solar-terrestrial relationships, the SCOSTEP core science, through the study of coronal mass ejections (CMEs) and their impact on Earth. Exceptionally for such a young scientist, in his research Dr. Savani employs a well-rounded arsenal of expertise in the analysis of both remote and in-situ observations as well as in the deployment of complex high-performance computing simulations. The appeal of his work to the broad research community is best summarized by his impressive h-index of 11 within 4 years of graduation. He has published 8 peer-reviewed articles as first author and contributed to 21 articles over all. During this time, he has won two highly competitive fellowships; the JSPS research fellowship at Nagoya University, and the Jack Eddy LWS Postdoctoral Fellowship at the Naval Research Laboratory, and has developed international collaborations with a large number of researchers. In addition to his modeling and data analysis capabilities, Dr. Savani has demonstrated a very creative mind, which has led him to key insights into the problem of the CME propagation in the inner heliosphere. He has created a flux rope model implemented extensively in several high impact publications and has suggested a radical change in the underlying theory of CME propagation by mathematically showing that the eccentricity of CMEs will reach a steady state under self-similar expansion. This is contrary to the outputs of the typical integrated space weather forecasting tools, which implement a hydrodynamic solar wind (i.e., ENLIL model) and hence result in extremely elliptical CMEs. This research has been followed by an insightful comparison between the morphology of Earth's magnetosphere and the magnetic obstacle of a CME. The results suggest that CMEs may have an even lower eccentricity. More recently, Dr. Savani has made two important far-reaching contributions. First, he has extended his earlier work on CME ellipticity by using high performance computing facilities in Japan to investigate the magnetic topology of simulated CMEs, solving the well-known disparity between remotely observed CMEs and those measured in situ upstream of Earth. His simulations have proven that the popular cylindrical topology inferred from in situ measurements could co-exist with remotely observed CMEs that appear stretched or 'pancaked'. Second, Dr. Savani has changed how the community views the solar winds parameters that influence the Earth's environment. Previously, the majority of the space weather forecasting research focused on understanding and correlating the Bz component of the solar wind magnetic field to the direct effects measured on Earth's environment. The paradigm shift in the research performed by Dr. Savani has shown that the effects of ram pressure of a CME can be isolated and shown to have a significant effect on geomagnetically induced currents measured on the ground. This work has also opened a potential forecasting capability by providing a proof of concept for measuring the ram pressure using remote observations. His current work focuses on improving these techniques to create a more reliable data set, which can be used as input into magnetospheric forecasting simulations for space weather predictions.

Dr. Savani has demonstrated rare skill in branching out of a single research domain in order to attack key scientific questions such as predicting Southward Bz, quantifying the influence of various solar wind parameters on Earth, and understanding the morphological changes occurring within a CME arriving at Earth. This ability to repeatedly perform significant

contributions in scientific literature with a large variety of scientists across the world demonstrates his ability to work within large, cross-continental teams and disseminate scientific discoveries.

Overall, Dr. Neel Savani has performed innovative research on CMEs, one of the key components of the solar-terrestrial relationship. His research is influential as evidenced by his high h-index. He maintains an active role within the SCOSTEP community as a member of the working committee of ISEST (International Study of Earth-affecting Solar Transients), one of the four elements of the SCOSTEP VarSITI program, and outstanding ambassador for the Solar-Terrestrial Physics community and SCOSTEP as a young scientist.