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Center for **IMAGING** SCIENCE Seminar Series

Remote Sensing of Atmospheric Phenomena Using GPS: Monitoring Space Weather

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Auditorium of the
Center for
Imaging Science

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Abstract

As mankind depends more and more on instantaneous global communications, we become more susceptible to space weather (variability in the earth's ionosphere) which can create hazardous conditions on earth, such as communications, radar and navigation blackouts. Our current capability for monitoring and forecasting space weather storms and issuing relevant alerts is limited by our sparse sensing of the ionosphere (currently provided by various satellite installations). There is a need for lower cost, consistent, daily monitoring, mapping and modeling of the ionosphere. Such a system may be at hand using ground based GPS.

Phase delays, imposed upon GPS timing signals by free electrons and ions in the intervening atmosphere, add noise and systematic errors to the trilateration (triangulation) calculations of geo-location by GPS algorithms, thereby reducing the precision and accuracy of GPS. As companies sought to provide progressively higher GPS accuracy and precision, they developed techniques to correct for these errors. However, the corrections themselves provide valuable real time information about dynamic conditions in the ionosphere and troposphere. In this seminar we will examine the processes used to measure the total line of sight electron content, examine how this technique can be used to produce a low cost sensor system that can monitor changes in the earth's atmosphere, and present some examples of initial results using this approach.

Speaker Bio

Dr. Dube received his Ph.D. in experimental physics from Princeton. He completed a post-doc position at Kitt Peak National Observatory working on improved array detectors, and took a position at Caltech/JPL working on deep space robotic probes for experimental general relativity. He went on to accept professorships at U. of Michigan and U. of Arizona, where he continued his work on weak signal detection techniques. He later joined IBM's Yorktown Heights Research division, and maintained an adjunct professorship at Yale. He is currently president and chief scientist at Digital Authentication Technologies, Inc. where he is co-founder and primary inventor of a physics-based authentication technology.