THE WILLIAM E. BOEING DEPARTMENT OF

AERONAUTICS & ASTRONAUTICS

... welcomes ...

THOMAS JARBOE

UNIVERSITY OF WASHINGTON

Solar Dynamo

A new model for the engine of solar magnetic activity is presented, developed through the union of foundational plasma physics and observed solar behavior, which together form a set of constraints on possible dynamo models. Key to this proposed model is the application of the process of plasma self-organization, which is shown to have a more powerful effect in the Sun than has often been assumed, and provides a feasible way to reconcile the size of the solar dynamo with the resistive diffusion timescales associated with its size. The resulting model consists of a thin, stable magnetic equilibrium covering most of the solar surface below the photosphere, arranged in a mesh within the supergranules, which is reshaped and reorganized on an 11-year half-cycle due to slow, large-scale solar activities. This periodic readjustment of the equilibrium triggers the observed magnetic activity, and the thinness of the equilibrium makes the solar dynamo under this model powerful enough to also fuel other solar phenomena, such as the chromosphere, the corona, the solar wind, and the current in the solar current sheet. A physics-based description of the solar magnetic activity is presented that agrees with observations, including the power to the chromosphere and corona, the heliospheric current sheet and its magnitude at the earth, the 180 degree flipping of the magnetic fields and the pattern of the radial magnetic field in the solar cycle, the flipping of the polar magnetic flux, sunspots, the differences of the corona during solar minimum compared to solar maximum and the plasma structure in solar prominences.

WILLIAM E. BOEING
DEPARTMENT OF AERONAUTICS & ASTRONAUTICS
UNIVERSITY of WASHINGTON

Monday, April 10, 2017 @ 4:00pm
Johnson Hall. Rm 102 | UW Seattle

Visitor RSVP:
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THE WILLIAM E. BOEING DEPARTMENT OF
AERONAUTICS & ASTRONAUTICS

... Distinguished Guest Speaker ...

THOMAS JARBOE
UNIVERSITY OF WASHINGTON

Professor,
Aeronautics & Astronautics

Professor Jarboe received his undergraduate degree in Engineering Physics from the University of Illinois in 1967. He worked a short time for Olin Matheson in East Alton, Illinois and then pursued a doctoral degree at the University of California, Berkeley. In 1974, he received his PhD in plasma physics. He then joined the controlled fusion research division at Los Alamos National Laboratory. He served as group leader from 1983 to 1989 where he studied a very attractive magnetic fusion confinement device called the spheromak. He spent one year beginning in 1985 doing the controlled fusion research at Culham Laboratory in England. He came to the University of Washington in 1989 as Professor of Nuclear Engineering and joined the Department of Aeronautics and Astronautics in 1992. He is a fellow of the American Physical Society.

Professor Jarboe's current research interests lie in plasma physics and controlled fusion. He is presently pursuing three plasma research interests. First, he is Director of the Plasma Science and Innovation Center (PSI-Center). The goal of the center is to develop computational predictability for improved magnetic confinement configurations with controlled fusion applications. The PSI-Center plays an important role in making fusion energy practical and in advancing plasma science in general. Second, he leads the Helicity Injected Torus (HIT) program on Campus. The HIT program investigates the formation and sustainment of fusion confinement configurations using helicity injection current drive. This method eliminates the need for the pulsed Ohmic heating transformer that is normally used and allows steady state operation. The present HIT experiment is developing constant inductive helicity injection for a spheromak. Developing an efficient current drive method for a spheromak that is compatible with good confinement would be a major advance for practical fusion energy. Finally, Professor Jarboe leads a collaboration with the Princeton Plasma Physics Laboratory, where coaxial helicity injection (CHI) current drive, developed at the UW, is being applied to the National Spherical Torus Experiment (NSTX). CHI is to be used on this major US fusion facility for plasma startup and current profile control.

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