OMICS International conferenceseries.com

J Aeronaut Aerospace Eng 2015, 3:3
http://dx.doi.org/10.4172/2168-9792.S1.008

International Conference and Exhibition on
Satellite
August 17-19, 2015 Houston, USA

## Intermittency development via plasma jets in the solar plasma flow at magnetospheric boundaries

**S Savin**
Space Research Institute RAS, Russia

A multi-point study at lowest frequency resonances at the outer magnetospheric boundaries on the fluctuations inside the magnetosphere is presented. The correlations of the dynamic pressure data from CLUSTER, DOUBLE STAR, GEOTAIL, ACE/WIND, particle data from LANL, Goes with the magnetic data from polar ionospheric stations on March 27, 2005, show that:

i) The boundary resonances and their harmonics penetrate inside the magnetosphere;

ii) Correlations between the dynamic pressure fluctuations and magnetospheric disturbances can exceed 80%;

iii) The new resonance frequencies are lower by an order of magnitude compared with our previous studies being down to 0.02 MHz

Analysis of different types of correlations shows that in ~48% of the cases with pronounced maximum in the correlation function the geosynchronous/ionospheric response is seen BEFORE the magneto sheath (MSH) reactions. We propose that some global magnetospheric resonances (e.g. membrane bow shock (0.2-0.5 MHz) and/or magnetopause (0.5-0.9 MHz) modes along with the cavity MHS/ cusp (3-10 MHz) and magnetospheric global modes (0.02-0.09 MHz)) can account for the data presented. Namely, the particular jets at the sampled MSH points can be a consequence of the resonances, while initial disturbance, resulted in the resonance excitations (e.g. through the SW fluctuations at frequencies being close to the resonance ones, interplanetary shocks, Hot Flow Anomalies, foreshock irregularities etc.), passed beside some MSH spacecraft.

ssavin@iki.rssi.ru

## Non-destructive testing of rocket fuel tank thermal insulation by holographic radar

**S Ivashov[1], V Razevig[1], I Vasiliev[1], T Bechtel[2]** and **L Capineri[3]**
[1]Bauman Moscow State Technical University, Russia
[2]Franklin and Marshall College, USA
[3]University of Florence, Italy

The Space Shuttle *Columbia* disaster occurred on February 1, 2003, killing all seven crew members. This and other incidents (e.g. with the Russian return vehicle which fortunately did not lead to catastrophic consequences) have aroused interest in the development of new methods for non-destructive testing of insulation and thermal protection coatings of spacecrafts and fuel tanks. In the opinion of NASA investigators, one cause of the *Columbia* disaster was defects in the thermal protection coating of the shuttle's external fuel tank containing cryogenic components. To reduce fuel vaporization and prevent icing of the tank surface which could damage the shuttle, the tank is covered with insulating polyurethane foam. Methods of ultrasonic diagnostics, which are widely applied for non-destructive testing of different constructions, are ineffective for foam insulation due to polyurethane's high porosity, which leads to high levels of acoustic attenuation. Similar considerations apply to the silicate fiber tiles that shield the outer surfaces of the USA Space Shuttle and Russian Buran. High porosity of the fiber tiles also produces incoherent scattering and attenuation. Microwave diagnostics using holographic subsurface radars could be a good alternative to ultrasonic testing. The basic advantage of microwave in comparison with ultrasonic methods is the fundamental difference in physical properties effecting the propagation of electromagnetic versus acoustic waves in heterogeneous media. Electromagnetic waves reflect from heterogeneities only when their dielectric contrast is sufficient. Thus, electromagnetic waves propagate practically without loss in foam insulation in which the matrix polyurethane has approximately the same permittivity as the air in the pores. A new method for using the holographic subsurface radar RASCAN 5/15000 to reveal internal defects of foam materials was proposed, and experiments on models of thermal insulation coatings were performed. The experimental results were displayed in the form of radar images on which defects in the heat insulation were shown to provide a good contrast and effective detection.

sivashov@rslab.ru