S263-p:13– How does the Solar Cycle state affect the observation of volatile compounds in meteoroids

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We discuss using high Solar Cycle (SC) atmospheric conditions as sensors for identifying volatile compounds such as water in shower meteors. High altitude meteor trails (HAMTs) have been observed sometimes with HPLA (High Power Large Aperture) radars. At other times such HAMTs are not observed. In the absence of systematic studies on this topic, we surmise that the reason might be differences in observing modes or in differing conditions during the observations. At EISCAT, high altitude meteor trails were observed in 1990 and 1991. Very high meteor trails were observed with Israeli L-band radars in 1998, 1999 and 2001. Through the Leonid activity, around the latest perihelion passage of comet Tempel-Tuttle, optical meteors as high as 200 km were reported. This was partly due to new and better observing methods. However, all the reported periods of high altitude meteors seem to correlate with SC maximum. The enhanced solar activity causes the atmosphere, as well as the ionosphere, to expand to higher altitudes. For example, at 200 km during the SC maximum the atomic O density is on average as high as the density about 20 km lower down during SC minimum. At 150 km the difference is about 5 km. At 400 km this altitude difference is close to 100 km. For the ionospheric part of the atmosphere the situation is more complicated and the altitude differences can be even larger. The constantly present meteor head echoes at HPLA radars show seasonal variations of their altitude distibutions, that correlate with the background atmosphere conditions. A preliminary study of head echo distributions shows altitude differences larger than 6 km at 100-110 km range between solar maximum and minimum. Thus, enhanced atmospheric and ionospheric densities might extend the meteoroid interaction with the atmosphere a long way along its path, offering a better possibility to distinguish between different compounds. This should be studied during the next solar maximum, due within a few years, both optically and with HPLA radars.

S263-p:14– On the Origin of Retrograde Orbit Satellites around Saturn and Jupiter

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Many more retrograde orbit satellites around Jupiter and Saturn have been found recently. Most of them are small with irregular shapes. They are far from the planet than regular satellites. Their orbits have big eccentricities.

We tested their dynamical origin and found:

1. The small bodies can be captured by normal satellites and form retrograde orbits. But these orbits are not stable. Sooner or later, they would escape from planetary region or fall down into the planets.

2. Another way is that they have formed by collisions just after regular moons formed. We studied the mechanism and obtained good results.

S263-p:15– DNA nucleobase synthesis at titan atmosphere analog by soft X-rays

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Titan, the largest satellite of Saturn, has an atmosphere chiefly made up of N_2 and CH_4, and including many simple organics. This atmosphere also partly consists of hazes and aerosols particles which shroud the surface of this satellite, giving it a reddish appearance. As a consequence of its high surface atmospheric pressure ($\sim$ 1.5 bar) the incoming solar UV and soft X-ray photons are mostly absorbed allowing virtually no energetic photons to reach the surface. However, during the last 4.5 gigayears, the photolysed atmospheric molecules and aerosol particles have been deposited over the Titan surface composed by water-rich ice (80-90 K) delivered by comets. This process may have produced in some regions a ten meter size, or even higher, layers of organic polymer.

In this work investigate the chemical effects induced by soft X-rays in the titan aerosol analog. The experiments have been performed inside a high vacuum chamber coupled to the soft X-ray spectroscopy (SXS) beamline at the Brazilian Synchrotron Light Source (LNLS), Campinas, Brazil. A gas mixture simulating the titan atmosphere (95% N_2, 5% CH_4) was continuously deposited onto a polished NaCl substrate previously cooled at 13-14 K and exposed to synchrotron radiation (maximum flux between 0.5-3 keV) up to 73hs. A small fraction of water and CO_2 was also continuously deposited on the frozen substrate simulating thus, a possible heavy cometary delivery at titan. The total energy deposited on the sample was about $\sim 10^{12}$ erg.

In-situ sample analysis were performed by a Fourier transform infrared spectrometer (FTIR) during the irradiation and during the sample slowly heating to room temperature. The infrared spectra have presented several organic molecules including nitriles and aromatics CN compounds. After the irradiation, the brownish-orange organic residue (tholin) were analyzed ex-situ by chromatographic (GC-MS) and magnetic resonances (H^1 NMR) techniques, revealing the presence of adenine ($C_5H_5N_5$), one of the constituents of DNA molecule. This suggest that the organic chemistry onto titan surface could be more complex then expected, being extremely rich in pre-biotic molecules. Molecules like these in the early Earth have found a place to allow life (as we know) to flourish.

S263-p:16– The Irregular Satellites of Neptune: A Window to the Young Solar System

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The origin of planetary rotation and obliquity is one of the fundamental questions of Cosmogony, and also has proven to be one of the most difficult to answer. Although the obliquity of the giant planets remains an openned question, it is believed that it might be due to stochastic processes at the end of the accretionary epoch ($e.\ g.$, Safronov 1969). If satellites had been orbiting around giant planets before large impacts had taken place, the impulse imparted at collision would have produced a shift in the orbital velocity of the satellites. Then, the present physical and dynamical properties of the irregular satellites of giant planets are used to set constraints on the scenario of giant impacts at the end of the formation of the Solar System, which implies contraints on models of planetary formation.

For the case of Uranus, constraints on the stochastic processes as the cause of the large obliquity of Uranus, physical conditions for this planet, dynamical constraints and restrictions on the possible mechanisms for the origin of the irregular Uranian satellites were obtained from the knowledge of the actual physical and orbital properties of these satellites (Parisi and Brunini 1997, Brunini $et\ al.$ 2002, Maris $et\ al.$ 2007, Parisi $et\ al.$ 2008).

Motivated by our results for the Uranian system, we carried out the first model of a giant impact on Neptune as the cause of this planet obliquity and set constraints on this scenario from the orbital properties of the Neptunian irregular satellites. In order to get the physical properties of this satellites, we start an observing program using FORS2 at ESO-VLT (ESO program 083.C-0526, PI: Maris). These observations will allow us to derive by first time their colors, which are the best source of information to know their relation to the precursor Kuiper Belt population, posing contraints on their origin, formation mechanism and models of planetary formation.