SATURN’S SWEEPER MOONS PREDICTED

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Abstract. The recent observation of the absorption of radiation belts in the vicinity of Saturn’s bright rings and historical observations of the ring system make the following related results apparent:

- The gaps in the rings are caused by the presence of at least 6 small, extremely dense and probably electrically charged ‘sweeper’ moons which effectively sweep the ring matter clean from the gaps. This is known due to the fading of the inner ring edges whereas the outer edges are well defined. Their orbital periods will differ from the expected Keplerian periods if the moons and Saturn do possess electric fields.

- Absorption of radiation belts near the rings (of Jupiter also) implies that the ring particles themselves are not absorbing the radiation but the small moons are. This is consistent with the observed radiation belt absorption near the outer Saturnian moons.

- If electric fields of the sweeper moons cause the ring edge fading as observed (and not simply gravitational), then Saturn itself must maintain an electric field in its vicinity by way of a sizeable proton wind to affect the uneven ring edge fading and will be surrounded by an H⁺ cloud at least to approximately the A-ring. This is consistent with the detection of an H⁺ cloud surrounding Saturn (Weiser et al., 1977, p. 755). The other possibility is that these moons are extremely dense and have very large internal magnetic fields.

- Because of their location, these moons must be captured and if very dense as believed, may be core remnants of a nova.

1. Discussion

The possibility of the existence of small moons orbiting Saturn within the gaps of the bright rings has not received attention other than in passing comments by many investigators. Resonance theorists claim that nothing can exist in the gaps and others believe the rings to be composed of material that could not form a moon 4.5 billion years ago inside Saturn’s roche limit. Pioneer 11 was unable to confirm the existence of the ‘sweeper’ moons (except for 1979–S2) because of ‘anomalous’ data (Filius et al., 1980, p. 425), and no logical explanation for their existence has been previously put forth.

Historic observations (Proctor, 1865, pp. 49 and 61–64; Alexander, 1962, pp. 140–141 and 168) show that the bright rings are sharply defined on the outer edges but fade gradually on the inner edges. This fading is uneven only in the B-ring. These observations also have shown that thin divisions have formed in the rings that later disappeared. These sightings have been ignored since no explanation has been put forth. Pioneer Saturn also detected the uneven fading of the rings (Gehrels et al., 1980, p. 436). Voyager’s photograph of the Jovian Sulfur ring also showed this same fading of the inner ring edge (Smith et al., 1979a, p. 933, Figure 10) with the outer edge being sharply defined as in the Saturnian rings. Like Saturn’s F-ring, the sulfur ring has a small (~ 40 km diameter) moon skirting the outer ridge edge.
The detection by Earth based radio telescope of an atomic hydrogen cloud surrounding Saturn (Filitius et al., 1980; p. 415) suggests the presence of a strong proton wind emanating from Saturn. This wind would be similar to the solar wind which seems also to have an excess current of protons. This allows a non-uniform electric field to exist between the negatively charged planet and neutralizing H⁺ cloud. The total negative charge of the planet would be equal to the combined positive charge in the proton wind and H⁺ cloud. Unfortunately, it is impossible for Pioneer or Voyager to discern if the origin of certain protons are from Saturn or otherwise, however, there are indirect methods (to be discussed) that will implicate their presence. This suggests that Saturn’s atmosphere is operating similar to the solar atmosphere but on a small scale.*

Pioneer Saturn’s encounter with 1979–S2 showed it to have a very high mass for its size and a strong magnetic field. There are two possible explanations. One is that the small moon was very massive and possessed a very strong internal magnetic field for its size. It can also be explained as due to a large net charge on the moon. A metal space craft in the non-uniform electric field of the moon would feel a strong induced dipole force (i.e., the induced dipole will always produce an attractive force, indicating to telemetry the presence of a 'large mass'). The high relative velocity between the space craft and the charged moon would also induce the high magnetic field at the space craft. As specific data is not available on ‘mass’ or magnetic field of this moon, a hypothetical example will illustrate the point.

For a cylindrical metal space craft in the non-uniform electric field of a highly charged small moon the ratio of electrical induced dipole force to gravitational force (axis of symmetry of cylinder in the direction of the moon) is given by

$$\frac{F_e}{F_q} = \frac{2q_0^2 \varepsilon_0 \pi a^2 \left(1 - \frac{r}{r + \Delta r}\right)}{(4\pi\varepsilon_0)^2 GM_1 M_2 (r^2)}$$

where \(q_0\) = charge on moon, \(a\) = diameter of cylinder = 10 m, \(M_1 = \) mass of moon = 2.2 \(\times 10^{17}\) kg, \(M_2 = \) mass of space craft = 250 kg, \(r = \) separation of \(M_1\) and \(M_2 = 100\) km, and \(\Delta r = \) height of cylinder = 2 m.

It is found that \(F_e/F_q = 10\) when \(q_0 = 300\) coul, corresponding to a surface potential of about 100 MeV on a 200 km diameter moon when the moon has an earthlike density.

Other evidence exists for the presence of small highly charged objects in interplanetary space, although most investigators would rather find alternate explanations for the phenomena. The surface ring formations found concentric around small impact basins on Callisto (Smith et al., 1979b, p. 970) are examples. They are identical to the patterns made by ferromagnetic filings around a current carrying wire (Halliday and Resnick, * This also supports my contention that the solar interior is not one of collapsed hydrogen, but has a large planetary type core since stars and planets alike have their initial formation in the galactic center (McCanney; 1981). I also believe the solar wind supports a similar H⁺ cloud beyond the orbit of Jupiter and that Saturn passes through this cloud constantly as it orbits the Sun, accounting for Saturn’s vast atmosphere and appearing as a small planetary nebula.