Jupiter has the largest magnetosphere in our solar system, it spans approximately 20 solar diameters wide and encompasses many of its orbiting moons. The magnetosphere of Jupiter can span from 100 Rj (where Rj = 71,400km) on the dayside to 150-200 Rj on the nightside due to the magnetosphere tail. Jupiter’s magnetic field is in three sections the outer region where the most variation occurs due to being bombarded with solar wind and interplanetary material. The middle zone, where it rotates with the magnetic field and shell of plasma that Jupiter produces. Finally, the inner zone, where the densest magnetosphere can be found around and close to the surface. In general, a magnetic field in a stellar object is created by an electrically conducting fluid, and in Jupiter has current flowing continuously through its core, which is maintained by the rotational motion of the planet. This induces two magnetic models an open and closed. In a closed case, the magnetic field is induced due to the stress of the centrifugal forces, all happening on trapped low-energy plasma due to the large and rapid rotation. In the open case, this is produced to make up for the centrifugal plasma that radiates out. This process produced a heliosphere from Jupiter, like the solar wind produced by the Sun. This can produce interesting characteristics on nearby objects, in particular Ganymede.

Ganymede is a particular interest as it produces its own magnetic field and can be found frozen into Jupiter’s magnetic field. Ganymede is larger than Mercury and Pluto and is found to be the ninth-largest object in the Solar System. Ganymede’s atmosphere is Oxygen rich, O, O2 and O3. This rich atmosphere is said to be due to UV light causing the icy surface of the moon to split the Hydrogen and Oxygen, the oxygen became trapped in the atmosphere and the hydrogen was expelled out into space. As mentioned, Ganymede produces its own magnetic field, and this production is due to the iron core that Galileo discovered. However, Ganymede isn’t large enough to keep the convection current going in its core, but it continues to have a magnetic field induced due to Jupiter’s tidal forces. Ganymede also has closed and open magnetic field lines, the closed field lines can be seen at around 30º below latitude. Due to the magnetic field Ganymede also traps charged particles, creating a radiation belt where a large amount of its charged particles congregates and group together.

We can observe and analyse the magnetic fields that are produced by Ganymede and how that is changing its interactions with Jupiter. This should produce some interesting spikes that we can observe through flybys of many space craft. This interaction should result in weathering, aurora, and Ganymede wobbling.

Aurora is produced due to the solar wind of charged particles from the sun, about 5 billion tons an hour in all directions. These charged particles have a very high energy, and they interact with magnetic field, and they interact and “snap” into the field and interact with the elements in our upper atmosphere. Aurora on Jupiter is largely produced by Io expelling large amounts of charged particles interacting with the atmosphere. On Ganymede there has been aurora observed due to the induced plasma that Jupiter produces and that interacts with Ganymede’s magnetic field and produces the aurora.

Weathering is a phenomenon due to the plasma bombarding the lunar surface and the particles that hit the surface and this modifies the surface. Ganymede also has weathering happen to it, this can be seen due to the asymmetric surface. This asymmetric surface is due to Jupiter’s magnetosphere plasma being directed to Ganymede and it collides with its poles. This causes the poles to be super bright and the ice on the surface radiates particles.

All these characteristics of Ganymede are things we can observe. We will first look at the magnetic field of Ganymede and how that interacts with the magnetic field of Jupiter. This is done though data and plotting graphs as showing in (Section of data) and producing a magnetic pole simulation between Ganymede and Jupiter (Section of coding). We then will look at the outcomes of these interactions and see the aurora produced on certain days of flybys that we have plotted and how this could affect the surface of Ganymede. All this should help to conclude the interactions of Ganymede and our solar system.