Summary

Neptune, one of two planets in our solar system recognized as an “Ice Giant” holds many mysteries. Among its many intriguing attributes are its atmospheric composition, the magnetic field with a multi-pole structure, and its hypothesis of formation. These distinctive features beg for further investigation and understanding. Neptune exhibits very distinctive characteristics that set it apart from the other planets within our solar system. As an Ice Giant, it stands out due to its large mass of 17 times Earth (Helled, Nettelmann, 2020). It is comprised of mostly volatile materials, like Oxygen and Carbon (Helled, Nettelmann, 2020). It is also a very large planet, it is the fourth largest in the solar system and four times the size of Earth (Helled, Nettelmann, 2020)! Its Atmosphere also accentuates its distinctiveness. Temperatures may range from 135 K (-138.15 C) to 71.5 K (-201.65 C) from 1 Bar to 6.3 Bar respectively (Helled, Nettelmann, 2020). It is mostly made up of Molecular Hydrogen (80.0%), Helium (19.0%), and Methane (1.5%) (Helled, Nettelmann, 2020). We know that Methane condenses at pressures below 1.5 Bar, so it is speculated that this forms the haze and clouds of the planet (Helled, Nettelmann, 2020). Neptune’s magnetic field is characterized by a multi-polar structure. Within the planets atmosphere there is a convective and electrically conductive region, covering around 20% of its radius (Helled, Nettelmann, 2020). This region is situated beneath the previously mentioned Hydrogen and Helium abundant atmosphere envelope (Helled, Nettelmann, 2020). It is believed that this region is crucial for the generation and sustainability of the magnetic field (Helled, Nettelmann, 2020). Dynamo models based on Voyager’s magnetic field date suggest that in the deep interior exists a region that is stably stratified or in a state of thermal-buoyancy driven turbulent convection (Helled, Nettelmann, 2020). A hypothesis for Neptune formation proposes a head-on collision occurred. This could explain Neptune’s “more convective and mixed” interior (Helled, Nettelmann, 2020). The collision has potential to penetrate the deep interior of the planet, eliminating distinct layers and has the possibility to erode the core. It would align with the measured heat flux and inferred moment of inertia (Helled, Nettelmann, 2020). Neptune’s has many unique features that need to be explored further. The intricacies of its multi-pole magnetic field and region behind its generation. Aswell as its mystery of its formation by a head-on collision that may have eroded the core. Neptune is patiently waiting for our next chapter of exploration and discovery.