

The Unusual Radiation Belts of the Ice Giant Planets

PhD project, Space & Atmospheric Physics Group, October 2023 start.

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In April of 2022 the results of the latest Planetary Science & Astrobiology Decadal Survey were announced in the USA, recommending that a mission to put a spacecraft in orbit around the planet Uranus should be NASA's highest priority flagship over the next decade. This mission will revolutionise our understanding of such "ice giants", and there are also plans to visit the other ice giant, Neptune. This project builds on our leadership in defining the science goals of these pioneering missions on the horizon.

The aim is to assess whether the unusual magnetic fields generated inside these ice giants could explain their equally unusual "radiation belts", all observed by *Voyager 2* when it flew by these planets in the 1980s. Radiation belts are regions of space around a magnetised planet where high-energy charged particles are trapped within the surrounding magnetic field structure. We have proposed that some of the unusual aspects of the ice giant radiation belts could be due to their more complex magnetic fields, compared to other magnetised planets like the Earth.

The work will involve simple numerical modelling of how charged "test" particles move through the two planetary magnetic field structures, to ultimately establish the extent to which observed radiation belt properties can be explained by the additional field complexity. As the project moves forwards there will be potential to greatly expand the numerical modelling effort, to compare all the Solar System's magnetised planets, to modify existing theory to the ice giants, and even extend beyond the Solar System with a more general assessment of radiation belts supported by multipolar magnetic fields.

Within the group the student will join a team of researchers studying all the planets in the Solar System. More broadly, the student will also join the international ice giant science community. Project results will be relevant for the Uranus flagship mission in preparation. Prospective applicants are encouraged to contact the supervisor for further information.