Looking for life: Unlocking the secrets of Enceladus' surface

Other

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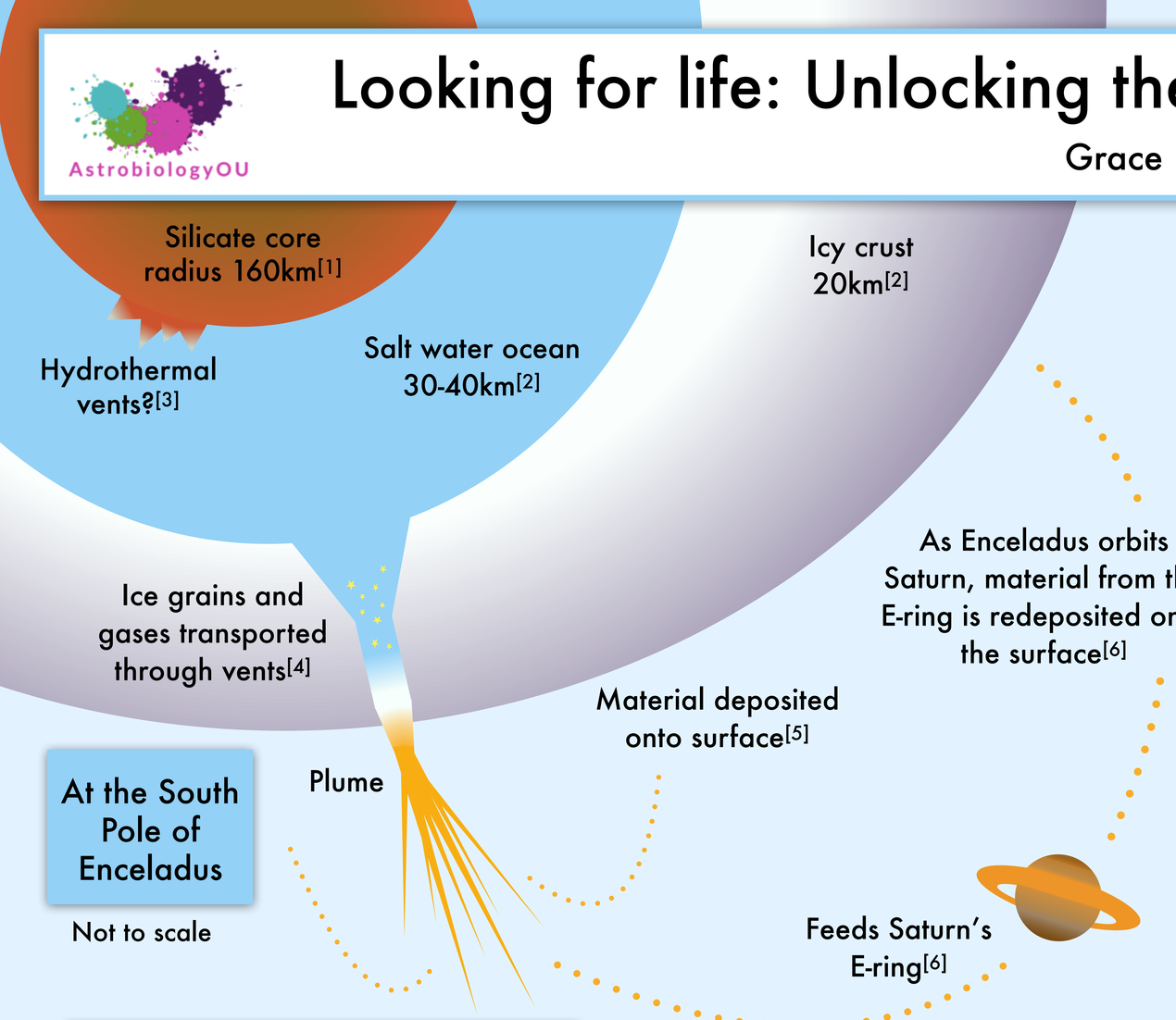


Aims of PhD

Develop protocols and instrumentation which could extract volatiles and analyse the icy surface of Enceladus:

- Establish representative ice compositions and determine if this could be indicative of habitability beneath the icy crust
- Develop apparatus and methods to grow ices in the lab
- Evaluate how composition is affected by space weathering processes
- Design a mass spectrometry-based instrument to analyse volatile components of ice
- Benchmark the performance of the instrument against commercial laboratory equipment

What do we expect to find?

Data for the surface composition comes from spectroscopy in the mid IR through to the far UV range. The only components which have been firmly identified are H_2O and CO_2. Plumes may deposit material and space weathering is expected to modify this[5].

- Water[7]
- Carbon Dioxide[7]
- Organics?[7]
- Ammonia?[7]
- Tholins?[8]
- Iron?[9]
- Hydrogen peroxide?[10]
- Methanol?[11]

Why go to Enceladus?

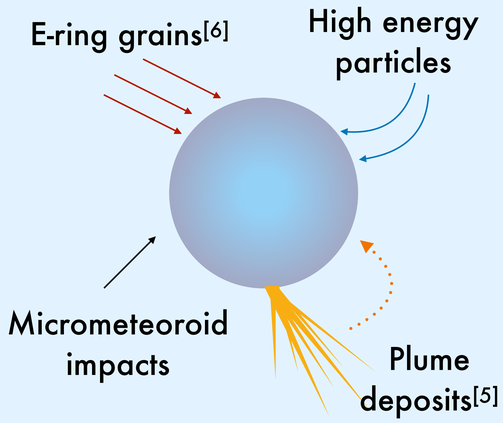
Enceladus is an icy moon of Saturn. It has a deep subsurface liquid saltwater ocean and plumes which eject material thousands of kilometres into space via fractures in the icy crust[12]. There is evidence for hydrothermal activity in the rocky core[3] and water-rock interactions which could provide the ideal chemical conditions required for life[13].

Requirements for life

Earth	Enceladus
Liquid water →	Liquid water[12]
Organic compounds →	Organic compounds (in plumes[14])
Energy source (i.e. Sun) →	Hydrothermal vents[3]

Space weathering

By theoretical modelling and laboratory simulations, I will determine how space weathering affects surface composition. Understanding how these processes affect the satellite is vital to developing instrumentation best suited to analysing surface components.



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