



Are you interested in studies on the search for life?

In the search for life in our galaxy, molecular spectroscopy and photochemistry play an important role providing signatures to biomarkers for life. These signatures are not always directly observable or visible from afar. A possible way to search for life is to study habitability in more detail using the diagnostic value that planetary ionospheres may offer. The planet's ionosphere acts as a planet's protective membrane, separating the lower atmosphere from the space above. Its photochemistry produces beautiful airglow and aurorae emissions that are visible from afar. This chemistry is also governed by the atmospheric composition and conditions. Thus, ionospheric properties may offer key information on the level of protection and presence of biomarkers.

On the Earth, the ionosphere protects life by filtering harmful solar UV light and by the minimizing the impact of stellar activity, thus preventing extreme variability. It also reveals the presence of neutral oxygen molecules in the atmosphere through the presence of internally cold oxygen ions in the ionosphere.

In summary, ionospheres can be of essential diagnostic value for a planet's habitability, both as probe for biomarkers and as possible biomarker itself. We aim to study this probing power in the search for life.

Main projects:

- **What are the key ionospheric properties to detect biomarkers?**
 - o *How does the chemistry relate to the presence of biomarkers in the atmosphere?*
- **How can ionospheres protect life?**
 - o *Can parameters of ionospheres be defined that relate to their level of protection?*

There is also an option to perform a literature study within this project.

This research is a collaboration between chemistry, astronomy, and planetary exploration.

Investigating Team at UvA:

HIMS: Annemieke Petrigani
Wybren Jan Buma
API: Jean Michel Désert
Carsten Dominik

Investigating Team at TU Delft:

Planetary Exploration: Daphne Stam
Stephanie Cazaux



Van 't Hoff Institute for Molecular Sciences
Dr. Annemieke Petrigani

Anton Pannekoek Institute for Astronomy
Dr. Jean-Michel Désert

Interested?

Apply by sending an email to
a.petrignani@uva.nl and j.m.l.b.desert@uva.nl

Desired starting date: September (can be earlier)