

Training Opportunity for Belgian Trainees

Reference	Title	Duty Station
BE-2021-TEC-EPS	Solar Radiation Storm Forecasting and Impact	ESTEC

Overview of the mission:

ESA's Space Environments and Effects Section supports the development of ESA missions and programmes by investigating the space environments within which they will operate, assessing likely effects and defining mitigation methods. Environments addressed include: High-energy radiation from radiation belts, solar-particle events and cosmic rays; plasmas encountered in planetary magnetospheres, the solar wind and artificially-generated charges and fields on spacecraft; micro-meteoroids and non-trackable debris as well as planetary atmospheres. The Section also initiates and manages related technology R&D activities. See its web page (<http://space-env.esa.int>) for more details.

Overview of the field of activity proposed:

In the past years there has been increased interest in the forecasting of solar-driven radiation storms (named Solar Particle Events or SPEs). This interest is driven by concerns of spacecraft, launcher and even aircraft operators concerned about the effects in components and humans. Specific concern surrounds plans for future human exploration missions beyond Low-Earth Orbit (LEO) placing astronauts outside the protective shield of the Earth's magnetosphere. ESA is pursuing a space weather mission named Lagrange to help forecast and characterise space weather which include such SPEs which would add to existing capabilities for monitoring the radiation environment in different locations in space through its range of radiation monitors. ESA is developing tools for forecasting these storms as part of its technology programmes which include both analytical and physics-based prediction tools to meet the needs of future missions and space exploration.

The activities you will be involved in shall include:

- A review of scientific understanding for Solar Energetic Particle (SEP) acceleration and propagation
- Developing familiarity with a range of European monitor data including SREM, IREM, EPT and NGRM, ESA's Solar Energetic Particle Environment Modelling (SEPTEM) Reference Data Set (RDS) plus new data from the US NOAA GOES satellites.
- An assessment of SEP measurements and forecasts utilising available radiation monitor datasets including analysis of data for possible contamination during periods of events when high-energy particles penetrate devices through shielding in such numbers that they can interfere with the nominal operation of monitors.
- Exploitation of the new SEP Advanced Warning System (SAWS) tool developed under the ASPECS project with analysis about its use for Human Spaceflight applications (including propagation through shielding).
- Comparisons with state-of-the-art physics-based models soon to be integrated into ESA's Virtual Space Weather Modelling Centre (VSWMC) for selected SPEs.
- Utilising software developed for ESA's Space Environment and Effects section for performing effects calculations and accessing data and effects tools.

Required education and skills:

- Master's Degree in a technical or scientific discipline: Aerospace Engineering or Physics
- Technical knowledge: Software Programming preferably in Python and/or optionally MATLAB.
- Good interpersonal and communication skills
- Ability to work in a multi-cultural environment, both independently and as part of a team
- Fluency in English and/or French, the working languages of the Agency