

The banner features a dark background with a vibrant blue and white aurora on the left. On the right, there's a green-tinted image of a person standing on a pedestal, looking up at a large, complex structure resembling a space station or a futuristic building. The text is overlaid on the left side.

NOVEMBER 2-6

2026 EUROPEAN SPACE WEATHER WEEK



Data-driven and physics-based
cross-scale Space Weather and Space Climate

Florence, Italy

Mission concepts and ideas for filling the observational gaps in the mesosphere and lower thermosphere-ionosphere

Topical Discussion Meeting

Time: Tuesday 3rd November 2026, 17:30 – 18:30 CET

Location: ESWW 2026, Verde Room

Conveners: Claudia Borries, Luca Spogli, Theodoros Sarris, Elisabetta Iorfida

ABSTRACT

The Mesosphere and Lower Thermosphere-Ionosphere (LTI) regions are critical interface regions between atmosphere and space. They host complex electrodynamic coupling processes involving neutral gas, plasma, magnetic and electric fields. These processes are central to the vertical coupling of the whole atmosphere, mediating geospace forcing from above and atmospheric dynamics from below. The Very Low Earth Orbit (VLEO, within the LTI) is increasingly attractive to satellite operators, due to orbital congestion and strict deorbiting policies. However, VLEO mission planning must account for severe atmospheric drag and material erosion. Improving the accuracy of atmospheric models in the LTI region is an urgent research priority.

Today, our knowledge of these complex neutral-charged and electrodynamic couplings is still insufficient. The LTI is currently suffering from the highest uncertainties in thermosphere-ionosphere models and severe scarcity of geophysical observations.

This topical discussion meeting (TDM) will elaborate on the need for relevant observations, emerging technologies, new observational options and the challenges connected with mission planning in VLEO.

GOALS

The outcome of this TDM helps raising the awareness about latest mission planning for VLEO. In addition, it updates current knowledge about scientific use cases and instrument developments. Finally, it helps shaping and refining the ideas for new mission concepts.

Key Questions

1. What are the necessary key observables in the LTI? What are the user needs connected to them in the LTI? What are the achievable observation uncertainties with remote sensing and in-situ observations and how can they advance whole-atmosphere models?
2. What challenges do satellite operators face when targeting VLEO? How can the knowledge of the Space Weather/upper atmosphere community help address these challenges?
3. What are the key ground-based observations that can at best complement the space-based observations?

TARGETED AUDIENCE

This TDM shall bring together researchers and experts in the reference domain as well as operators of existing or planned VLEO missions.

Key participants take part in the mission advisory group of the ESA Earth Explorer 12 candidate mission Keystone, the Daedalus+ mission science team and the ESA project “Atmospheric Research using In situ Measurement of the Acceleration in the Thermosphere” (ARIMAT).

Exchanging ideas and perspectives between these groups, the space weather scientific community and industrial users would be greatly beneficial to all.