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Space weather and disaster control

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Space weather can cause significant disruptions to technical infrastructure, resulting in increased security risks, economic losses and a reduced quality of life. Operators of critical infrastructure, such as power grids or satellites, are increasingly aware that extreme space weather events can have a severe impact on their systems. Space weather can therefore be a crucial factor in the event of a disaster. For example, disturbances of the ionosphere due to space weather can affect navigation and communication in an emergency scenario and must therefore be known in advance so as not to compromise rescue operations. Furthermore, an extreme space weather event itself can trigger a disaster if, for example, satellites and power grids are damaged or destroyed.
We are currently in an optimal phase within the 11-year solar cycle for studying and evaluating the influence of space weather on various technologies (maximum solar activity 2024-2026).

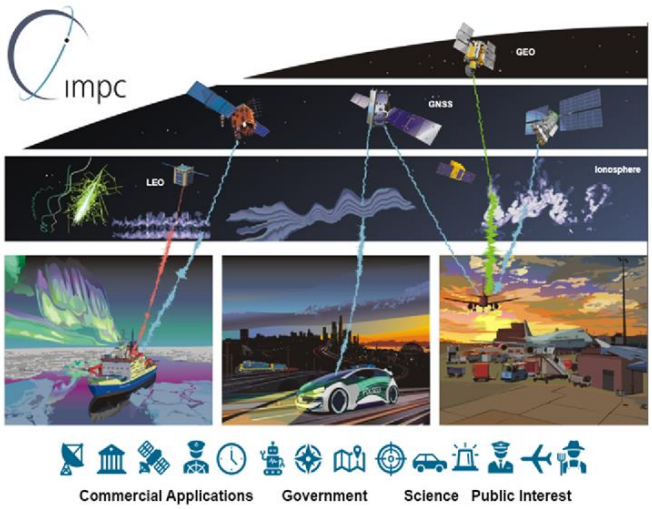

Figure 1. Artist view on the various effects of space weather events on communication and navigation services.
Credits: Dmytro Vasylyev

In the presentation we show examples how navigation and communication services under the influence of space weather-related ionospheric disturbances have only limited accuracy or fail completely. In the DLR impuls-project RESITEK we further investigate these effects on specific use cases in order to develop suitable protective measures. To this end, current space weather events and specific historical events are being investigated and evaluated in terms of their impact on technological systems in various model regions. The aim of the project is to integrate space weather information into a common data and visualization portal in order to capture a crisis situation comprehensively. This should provide emergency services and rescuers with the additional information they need to carry out targeted and efficient actions. We will present objectives and initial results from the RESITEK project and discuss the relevance of space weather in the event of a disaster.

1. J. Berdermann, M. Kriegel, D. Banyś, F. Heymann, M.M. Hoque, V. Wilken, C.Borries, A. Heßelbarth, N. Jakowski, "Ionospheric response to the X9.3 Flare on 6 September 2017 and its implication for navigation services over Europe", Space Weather, 16, 2018, 1604-1615, doi: 10.1029/2018SW001933

2. E. Schmölter, J. Berdermann (2024), , "Weather and Space Weather driven Variability of ADS-C Reports in New Zealand Airspace," in IEEE Transactions on Aerospace and Electronic Systems, Vol. 60, Issue 6, pages 8034-8053, ISSN: 1557-9603 doi: 10.1109/TAES.2024.3423029.