

# GERMAN SPACE WEATHER INITIATIVES

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## ABSTRACT

At present, there is neither a national Space Weather Initiative nor any initiatives on a research group level in Germany, simply because no specific German user needs could be identified. However, German research groups have a wealth of knowledge in all fields of solar-terrestrial physics (STP), from the sun through the interplanetary medium and the magnetosphere down to the auroral and mid-latitude ionosphere. Recognizing European user needs, as expressed during this symposium, the German STP research community is willing to contribute their STP expertise toward the common goal of a European Space Weather Initiative and some groups may actively take part in providing space weather services.

## 1. DEFINITIONS

During the last years, the scope of the term *space weather* has become somewhat diffuse and now sometimes is a synonym for *solar-terrestrial physics*. While this may be politically opportune, it is often clearer to distinguish between basic research, i.e., solar-terrestrial physics, and its application, *space weather forecasting*. Space weather forecasting deals, just as the normal weather forecast, with the dynamic aspects of the interplay between the sun, the heliosphere and the Earth's magnetosphere and ionosphere. Hence, modeling the space environment, i.e., the average topography and properties of the Earth's magnetosphere, and understanding radiation effects on flight hardware and software and the human body, should, in the author's opinion, not be summarized under the heading of space weather and will not be considered here.

## 2. PRESENT SITUATION IN GERMANY

The German space physics community has a long-standing tradition in solar-terrestrial physics. At present German space scientists are involved in many recent and forthcoming missions covering the whole chain of processes involved in space weather, from the sun and the interplanetary medium (e.g., SOHO), to the Earth's magnetosphere (e.g., Equator-S) and ionosphere (e.g., Champ). German space physicists have also been

involved in illustrating space weather by, for example, showing how solar disturbances like coronal mass ejections travel through interplanetary space and lead to magnetic storms in the near-Earth's environment.

However, at the time this report is written, there have been no attempts in Germany to establish a national space weather initiative, nor have there been any other initiatives by German groups aiming for space weather forecasting in an operational sense. The reason for this is simply that no prospective German users have voiced any needs for something like a daily space weather report. This is quite natural since Germany lies at mid latitudes and its power lines or radio communication are much less influenced by space weather effects than those of the Scandinavian countries, where some operational aspects of space weather forecasting are already in place.

## 3. PARTICIPATION IN A EUROPEAN INITIATIVE

On a European level and at the present time, the situation concerning prospective user needs has changed: (1) Due to upcoming EU legislation, European airlines will likely be concerned about space weather to avoid high radiation dosage for their personnel when flying high-latitude routes. (2) Future European spacecraft for Earth observations, communication, and global positioning might be injected into low-Earth orbits and spacecraft operators need to be warned about bad space weather conditions in this potentially hazardous environment. (3) With the increasing importance of GPS-techniques in Europe, changes in ionospheric density due to space weather effects need to be known well enough to ensure signal timing accuracy and thus accurate positioning.

Some German space physics groups have recognized this change in potential user needs and already started scientific studies (some of which are presented in this volume) which may lead to more operational predictions about, for example, density changes in the mid-latitude ionosphere. Within a European initiative, German groups will likely make their scientific knowledge, data, and computer simulations available for space weather forecasting. To what extent German space scientists will actively participate in the operational aspects of space weather predictions remains to be seen and will depend on the actual structure and funding of a European Space Weather Initiative.