



WEATHER EFFECTS ON SPACE AND CYBERSPACE OPERATIONS

Last Updated: 28 October 2020

Just as weather affects air operations, weather can directly impact space systems and the services they provide, such as navigation; communications; and intelligence, surveillance, and reconnaissance. Similarly, weather affects the ability to leverage the electromagnetic spectrum (EMS), leading to impacts in the cyberspace domain.

ATMOSPHERIC WEATHER EFFECTS ON SPACE OPERATIONS

Atmospheric weather affects space supporting ground sites and launch and recovery of space assets. For example, severe weather approaching a launch range can cause delay or damage to critical launch infrastructure and global space mission operations. Rain may cause signal attenuation (due to absorption of radio signals by water vapor), hindering satellite communications (SATCOM) in higher frequency ranges.

SPACE WEATHER

Space weather is described as, “the conditions and phenomena in space and specifically in the near-Earth environment that may affect space assets or space operations” (Joint Publication 3-59, [Meteorological and Oceanographic Operations](#)). The Department of the Air Force (DAF) is responsible for conducting space environmental (space weather) operations in support of all elements of the Department of Defense (DOD) and the intelligence community.

Specially trained DAF weather personnel continuously monitor the space environment from the sun to near-earth space environment. Space-based satellites and ground-based systems that observe the sun and space environment assist forecasters in their analysis, forecasting, and integration of solar activity and other space weather effects information in the planning and execution of military operations.

Space Weather Effects. Space weather has a direct impact on space systems and the capabilities provided to operations. Space weather, such as a proton event (high-energy charged particles released from the sun) or spacecraft charging event (accumulation of energetic electrons), can disable satellite subsystems or even an entire spacecraft (temporarily or permanently). By extension, a great deal of cyberspace mission data

transits the space domain; therefore, space weather interference on space systems affects operations in the cyberspace domain. Additionally, weather can have a significant impact on the ability to transmit data through the EMS. These effects directly impact operations in the cyberspace domain and the operations that require use of EMS.
