ENVIRONMENTAL MONITORING

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Environmental monitoring is conducted *for* space and *from* space. Environmental monitoring provides data on meteorological, oceanographic, and space environmental factors that may affect military operations. Monitoring the space domain provides data that forms the basis for forecasts, alerts, and warnings on space environmental factors that may negatively impact space assets and space operations. Environmental monitoring of space, discussed earlier in this chapter, enables development of space situational awareness. Environmental monitoring from space enables development of terrestrial battlespace awareness.

A prime advantage of space-based environmental monitoring capabilities is their ability to gather data regarding remote or hostile areas, where little or no data can be obtained via surface reporting stations. For example, space-based environmental data is critical over most oceanic regions, where data can otherwise be very sparse. Environmental satellites typically gather data in the visual, infrared, and microwave spectral bands. Infrared sensors provide images that are based on the thermal characteristics of atmospheric features such as clouds and Earth features such as land masses and water bodies. This data can be used to calculate the altitude of clouds and temperature of ground or water surfaces. Thermal and visible images together provide the coverage and extent of clouds at various levels, as well as other physical features such as ice fields and snow. Current microwave sensors are used to measure or infer sea surface winds (direction and speed), ground moisture, rainfall rates, ice characteristics, atmospheric temperatures, and water vapor profiles.

Environmental monitoring capabilities from space-based assets include multispectral imagery and hyperspectral imagery which can provide joint force planners with current information on sub-surface, surface, and air conditions (e.g., trafficability, beach conditions, vegetation, and land use). Knowledge of these factors allows forces to avoid adverse environmental conditions while taking advantage of other conditions to enhance operations. Such monitoring also supports joint intelligence preparation of the operational environment (JIPOE) by providing the commander with information needed to identify and analyze potential adversary COAs. The figure, **Defense Meteorological Satellite Program,** depicts a space-based environmental monitoring capability used for obtaining meteorological data. Environmental monitoring data may also be derived from non-DOD satellites, such as National Oceanic and Atmospheric Administration (NOAA) weather and National Aeronautics and Space Administration (NASA) research satellites, which are used by the Air Force weather wing and the Fleet Numerical Meteorology and Oceanography Center to support joint forces and Services.

Defense Meteorological Satellite Program