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# SPACE-BASED REMOTE SENSING AND EARTH OBSERVATION TECHNOLOGIES FOR CLIMATE ADAPTATION AND MITIGATION

**Abstract**

The Earth's climate system is subject to significant environmental, economic, and social impacts as a result of climate change. Accurate and reliable data on the climate system is crucial for mitigating and adapting to these effects. Space-based remote sensing and Earth observation technologies, such as Synthetic Aperture Radar (SAR) and Light Detection and Ranging (LiDAR), provide this data and are therefore vital tools for understanding and addressing climate change.

SAR and LiDAR provide detailed information on climate-related variables such as vegetation cover, topography, and soil moisture, which can be utilized to improve weather forecasting, inform climate model development, and assess land use changes on the climate. SAR, in particular, can provide information on surface soil moisture, a crucial variable for understanding the water cycle and its impact on the climate.

Weather forecasting is essential as extreme weather events are becoming more frequent. Space-based instruments such as geostationary and polar-orbiting meteorological satellites provide synoptic-scale weather information, enabling improved predictions of severe weather events such as hurricanes, floods, and droughts. Advanced sensors, such as the Advanced Baseline Imager (ABI) and the Geostationary Operational Environmental Satellite (GOES) series, offer high spatial and temporal resolution data on weather patterns, resulting in more accurate forecasts.

Earth observation technologies, such as multi-spectral and hyperspectral sensors, provide information on changes in the Earth's surface, including glacier retreat and sea level rise, as well as changes in land use, deforestation, and other human activities that contribute to climate change. These data can be used to understand the impacts of climate change on ecosystems and inform conservation and land management decisions. The use of active sensors like LiDAR in combination with passive sensors can provide complementary information on the Earth's surface and improve data accuracy.

In this paper, we have demonstrated the importance of space-based remote sensing and Earth observation technologies in providing accurate and reliable data on the Earth's climate system. These technologies are vital tools for understanding and addressing climate change, as they can furnish detailed information on climate-related variables such as vegetation cover, topography, and soil moisture. We have also highlighted how can enhance these technologies and improve data accuracy. Furthermore, we have emphasized the importance of a sustained and coordinated use of these technologies in providing valuable information for decision-making and policymaking in climate adaptation and mitigation. The conclusion is these technologies are crucial for mitigating the effects of climate change and adapt accordingly.