Paper ID: 88067
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IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Sensors and Technology (3)

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PROFILING THE PLANETARY BOUNDARY LAYER FROM SPACE: A REVIEW OF CAPABILITIES, LIMITATIONS, AND FUTURE PERSPECTIVES

Abstract

The planetary boundary layer (PBL) is the layer of the atmosphere closest to the Earth's surface, within which most human activities take place. The ABL is directly influenced by the exchange of heat, moisture, and other constituents, with the surface, biosphere and anthropogenic activities. In return, human activities are directly influenced by the ABL in the form of wind, temperature, humidity, fog, clouds, precipitation, and air quality. Atmospheric profiling has the ability to measure atmospheric conditions at various heights and is hence critical for better understanding of key atmospheric processes. The importance of ABL profiling has been recognized for several critical areas of societal needs, such as energy security, public health and safety, transportation, water resources, and food production. Monitoring and forecast of severe weather, renewable energy sources, aviation hazards, and air pollution dispersion are just a few high-impact societal applications that would strongly benefit from accurate ABL profiling. ABL profiling from ground-based remote sensing has increased in the last decade, leading to the establishment of international networks. However, ABL profiling from ground is limited to instrumented sites and lacks global coverage. Instruments capable of ABL profiling from space also exists, with their pros and cons. This presentation reviews the current technologies available for ABL profiling from space, discussing their advantages and limitations with a hint of future perspectives.