EKO

Solar Irradiance sensors for UAV applications

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Beyond Accuracy.

Recently there has been an increasing interest in the industrial use of "Unmanned Aerial Vehicle (UAV)," applications include: security, monitoring (construction site, natural environment), agriculture (pesticide spraying), logistics, inspection to name a few. In the field of solar radiation, more and more people are showing interest in the use of UAV for their research.

EKO Instruments Co., Ltd. have designed and manufactured sensors to be utilized in such applications. A group led by Dr. Sheng-Hsiang Wang, Associate Professor of the Department of Atmospheric Sciences, National Central University in Taiwan has installed the MS-80U albedo configuration and ML-01 on a drone to make a vertical profile of the albedo solar irradiance.

New and innovative techniques are required to gain more knowledge of the ever-changing atmospheric conditions and the effect this has on the environment. Current methods of measuring solar irradiation in the vertical profile of the atmosphere still have limitations and issues concerning measurement uncertainty.

UAV is one of the new methods commonly used in observational studies due to their maneuverability, size, and versatility. The purpose of this study is to construct the Unmanned Aerial System (UAS), based on a quadcopter which includes sensors to measure radiation, temperature, humidity, and pressure to gain a better insight to the vertical structure of the atmosphere and to improve the predictability of weather and climate models further.

Dr. Sheng-Hsiang Wang and his colleagues in Taiwan has installed the MS-80U and ML-01 on their UAV to measure upward and downward radiation.

The MS-80U has been reduced in size and weight compared to the conventional model (MS-80) while maintaining performance. Due to the lightweight and size of the MS-80U, it can be used in various airborne applications. The MS-80U is a secondary standard pyranometer conforming to ISO 9060. Featuring a fast detector response (<0.5sec @95% or <1sec @99%) and the lowest zero offset available, enables the sensor to more accurately measure irradiance values when the sensor will fly in a vertical pattern. The

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ML-01silicon diode pyranometer responds to the visible and near-infrared spectral range from 400 nm to 1100 nm and features a very fast response time due to its photodiode detector (less than 1msec). Additionally, the ML-02 is a lower profile version of the ML-01 which can be utilized in applications where size and weight of the sensor is an essential factor.
The objectives of this experiment include:
1. Utilizing a UAS to measure the vertical profile of shortwave radiation fluxes together with other relevant parameters over grassland and forest surfaces, to characterize the upward/ downward SW radiation vertically.
2. Developing correction methods for radiation measurements on an unleveled UAV platform.
3. Evaluating observed radiation flux, refractive, and transmittance in the parallel-plane radiation transfer hypothesis.
4. Comparison of albedo observations from satellite and UAV.

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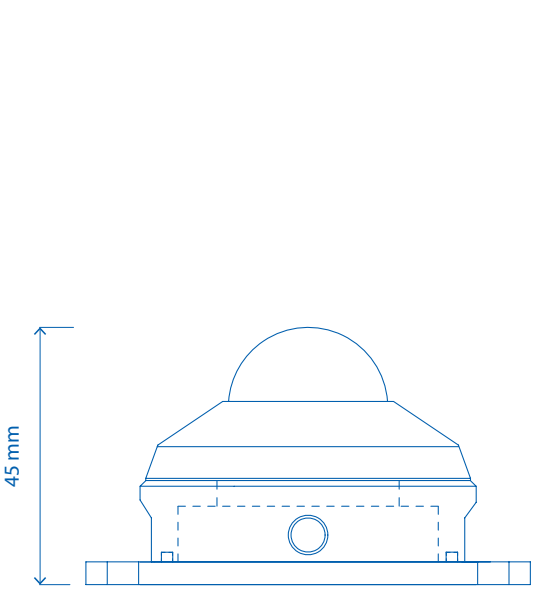

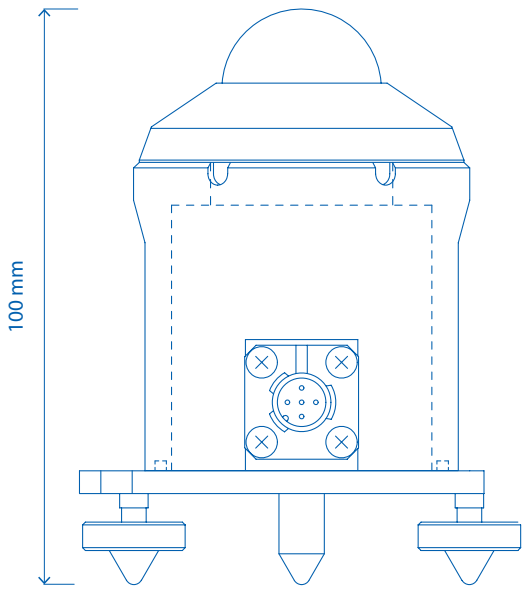

ABOVE. Schematic drawings of MS-80U (left) and MS-80 (right).

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