

## ***Interactive comment on “A comprehensive in situ and remote sensing data set from the Arctic CLOUD Observations Using airborne measurements during polar Day (ACLOUD) campaign” by André Ehrlich et al.***

### **Anonymous Referee #2**

Received and published: 19 August 2019

General review comments: This manuscript introduces the in situ and remote sensing data set from the Arctic CLOUD Observations Using airborne measurements during polar Day (ACLOUD) mission. Mission concept, vehicles, instruments and data obtained are comprehensively documented. Since this is simply a documentation for a measurement mission, this reviewer cannot find apparent flaws in the paper, thus recommend it to be published.

Minor corrections:

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1. The text should be more concise. The authors should find way to significantly reduce the length.

## 2. Section 2.3

"Upward and downward broadband irradiances were measured by pairs of CMP 22 pyranometers and CGR4 pyrgeometers, covering the solar (0.2-3.6  $\mu\text{m}$ ) and thermal-infrared (4.5-42  $\mu\text{m}$ ) wavelength range, respectively. Both aircraft, Polar 5 and 6, were configured with an identical set of instruments and sampled with a frequency of 20Hz. In stationary operation, the uncertainty of the sensors is less than 3% as characterized by the calibration of the manufacturer and evaluated by, e.g., Gröbner et al. (2014). For the airborne operation of the fixed-mounted sensors, the misalignment of the aircraft was corrected by applying the approach by Bannehr and Schwiesow (1993), and Boers et al. (1998), which was applied for the downward direct solar irradiance. Therefore, the fraction of direct solar radiation was estimated using radiative transfer simulations (cloud free and cloud covered). The simulations were based on available in-flight observations and consider the temperature and humidity profiles and cloud cover. In case of clouds, the cloud optical thickness was fixed to a representative value of 5. The upward solar radiation as well as the upward and downward terrestrial radiation were assumed to be isotropic and were not corrected for the aircraft attitude. ..."

This paragraph shows the RT model is used in the data, but the justification and uncertainty of this treatment is not well discussed.

This paragraph also assumes "The upward solar radiation as well as the upward and downward terrestrial radiation were assumed to be isotropic". This is not valid for solar radiation. What's the effect of this assumption?

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