**BOS #2: Improving Understanding of Cloud and Precipitation Processes using mmPARs**

Moderators: Pierre Kirstetter and Pavlos Kollias

Place: Redbug Cafe

This breakout session is dedicated to laying out the unique advantages of millimeter-wave imaging phased radars for a cloud and precipitation science. Specifically, we seek to identify what are the key science gaps and processes involving cloud and precipitation that mmPARs can address, document, and possibly resolve with the following combined capabilities:

1. Improved temporal sampling (20 – 30 s)
2. 3D coverage and continuous vertical sampling
3. High spatial resolution (tens of meters)
4. Excellent sensitivity (<-30 dBZ at 5 km range)
5. Dual-polarization

**Brainstorming Topics and Voting Discussion Priorities (15 min):**

At the outset of the break-out, we will set up a Google Jamboard to foster brainstorming of mm-Wavelength PAR capabilities for cloud and precipitation (~10 min), e.g., for precipitation formation, cloud and precipitation microphysics, influence of aerosols on clouds. After the brainstorming period, we will vote on prioritizing proposed topics to identify the top 5 for further discussion (~5 min).

**Topic Discussion (75 min):**

We will spend about 15 min discussing each of the top 5 responses from the brainstorming session. During this discussion, workshop attendees are asked to consider the following questions:

1. Within this topic area, what are the primary science questions? Why can they not be addressed with existing technology (e.g., processes occurring over too small spatial and temporal scales, not sufficient backscattering)?
2. What aspects of a mmWave PAR would be most beneficial for this topic? High-temporal resolution, vertical sampling (native RHIs), high spatial resolution, etc.?
3. What would be the added value of combining mmWave PAR with another sensor?
4. What are the downsides to using a mmWave PAR for this topic and how could potential risks be mitigated

**Summarize discussion on Jamboard (30 min)**

To prepare for report out sessions and synthesize notes for a workshop report, we will use the final 30 min to conduct a high-level discussion of the scientific value of mmPARs for clouds and precipitation. As time permits, attendees should discuss how mmPARs would be integrated into field campaigns and used synergistically with other instrumentation.