

RELAMPAGO Hail Pad Data

Author:

Dr. Matthew Kumjian
Department of Meteorology & Atmospheric Science
The Pennsylvania State University
503 Walker Building
University Park, Pennsylvania, 16802, USA
Email: kumjian@psu.edu
Phone: 814-863-1581
Website: <http://sites.psu.edu/kumjian>

1.0 Data Set Overview:

This dataset contains hailstone maximum size estimates based on hail pad impacts collected during the RELAMPAGO field campaign in November-December 2018. The hail pads were adaptive in nature, in that they were deployed (often with Mobile Mesonet Pods) during IOPs.

For use of this data, please contact the author.

2.0 Instrument Description:

The hail pads were small, portable polystyrene pads covered in aluminum foil, supported on a steel plate, and a bolt through the center was used to anchor them to the ground. For example:



Photograph of hail pad in front of the Doppler on Wheels radars. Taken by M. Kumjian.

3.0 Data Collection and Processing:

The hail pads were deployed during select IOPs in advance of the storms. Any hail pad that sustained impacts from hail and/or large raindrops were further analyzed. The maximum dimension of hail pad impacts were measured manually with digital calipers. These measurements were converted into hailstone maximum dimension using the empirical transfer

function, courtesy of Drs. Bruno Ribeiro and Luiz Machado at the *Instituto Nacional de Pesquisas Espaciais* (INPE), in Brazil:

$$\text{Estimated hail size (mm)} = 0.9662 \times (\text{hail pad impact size in mm}) + 3.5952$$

Note that this differs from the common CoCoRaHS hail pad conversion because the materials used in the construction of these hail pads were different.

4.0 Data Format:

The data are contained in a spreadsheet. Headers include IOP number and date, followed by a listing in each column of probe name (convention varied from IOP to IOP), location (lat/lon, in degrees) of the hail pad, starting and ending times, if available (in UTC), and the total number of impacts on each pad. The list of estimated maximum dimensions follows for each hail pad (in mm).

5.0 Data Remarks:

Note: some of the smaller hydrometeor impacts may be large raindrops with or without ice cores. The lower quality of the materials used to construct hail pads compared to the CoCoRaHS standard means we were unable to distinguish these smaller particles.

Data exist for IOPs 4, 9, 10, 14, 17.

6.0 References:

Preliminary data presented at the American Meteorological Society Annual Meeting in January, 2020:

Kumjian, M.R., P. Maldonado, B. Ribeiro, J. Soderholm, N. McCarthy, K. Lombardo, K. Kosiba, J. Wurman, L. Machado, P. Salio, 2020: Hail size and dual-polarization Doppler on Wheels radar observations during RELAMPAGO. *AMS Annual Meeting*, Poster #932, Boston, MA.

<https://ams.confex.com/ams/2020Annual/meetingapp.cgi/Paper/364570>