Author: **Dr. Jennifer Davison**
Lower Atmosphere Research Group, LLC.
1911 Sykes Creek Dr.
Merritt Island, FL 32953
(502) 930-5870
jldavison@me.com
ORCID# 0000-0001-5169-6229
ResearcherID# F-4912-2015

1.0 Data Set Overview:

Enhanced Bragg Scattering Layer (EBSL) Analysis[1] is an automated technique for detecting the average tops and bases of layers of enhanced Bragg scatter from individual S-band radar Plan Position Indicator (PPI) scans. EBSL edges are identified by sharp gradients in radar reflectivity when analyzing data with values lower than 12 dBZ for this data set. Appropriate data will have alternating rings of higher and lower reflectivity values. Bragg scattering is inferred by virtue of reflectivity values, so independent confirmation from ancillary data is always advised (refer to references below for more detailed information about EBSLs and this process).

This data set consists of EBSL top and base altitude estimates for the National Weather Service KDDC radar (Dodge City, KS: 37.761° Lat., -99.968° Long., 789 m Elev.) during the Plains Elevated Convection at Night (PECAN) field campaign (0802 UTC 25 May 2015 - 0710 UTC 16 July 2015). Real-time plot movies and quick-looks from the project are available online on the PECAN field catalog hosted by NCAR (http://catalog.eol.ucar.edu/pecan/radar). Date selection for these movies/plots can be made from the Choose Other Date link next to the calendar icons in the screen centers at either the top or bottom of the page. The corresponding data plots can be found by scrolling down to the appropriate radar and clicking on one of the Bragg Scattering Layer 24hr Plot links.

[1] The name of this technique in all past work is "Bragg Scattering Layer" (BSL) analysis. It has been changed to "Enhanced Bragg Scattering Layer" (EBSL) analysis to acknowledge the common occurrence of Bragg scattering throughout the lower atmosphere and to clarify that this technique targets the better-developed or "enhanced" layers.

2.0 Instrument Description:

Please refer to www.weather.gov for more information about individual NWS/NOAA NEXRAD radars.

3.0 Data Collection and Processing:

An EBSL scan-mean top and base is found for each EBSL within all PPI scans with average elevation angles > 4 and < 12 deg. The EBSL tops are denoted by *topsplus4* and the bases by *topsminus4*[2], and elevations are given in [m above ground at the radar site]. A single scan generally has more than one EBSL, so multiple altitude estimates are common for a single scan. Convention is that the EBSL tops are plotted in red and the bases in blue. Because these estimates are scan averages, things like inhomogeneous layers, non-sharp transitions into and out of EBSLs, or false EBSL detections (etc.) can prevent the tops and bases from being perfectly partnered (ie., a base for every top or vice versa). Due to the range gate resolution (250 m), only the 4th level wavelet iteration processing was used (refer to Davison et al. 2013).

4.0 Data Format:

There is one data file for each radar volume. An example is:
PECANlayerdata12dbzKVNX201507160715.mat
where PECAN references the project, 12dbz references the maximum reflectivity value included in the analysis, KVNX references the radar, the numbers are the yyyymmddHHMM of the radar volume, and the .mat indicates that the files are in Matlab data format.

There are three variables in each file: *radarDateNum*, *topsplus4*, and *topsminus4*. Each variable has [1 x *# of valid elevation angle scans in volume*] dimensions.

radarDateNum is of type *double* and is the serial date number of the first beam of the given scan in the radar volume (generated from row 1 of the appropriate scan column of the NWS level-II

[2] Naming convention has to do with analysis choices and does not refer to the EBSLs themselves.

variable *timeR*). It is generated using the *datenum* command in Matlab. Using the command: *datestr(radarDateNum)* in Matlab will reverse this and produce a recognizable date and time string like *16-Jul-2015 07:18:29*. Refer to Matlab online help for more information about *datenum* and *datestr*. Because each scan has a unique start time, elevation angle can be retrieved from the original NWS data. Times are given in UTC.

topsplus4 and *topsminus4* are of type *cell.* This means that each column of data can house a different number of data points (which reflect the number of scan-mean EBSL edge detections for that variable and scan). Refer to Matlab's online documentation for more information on the *cell* data type.

5.0 Data Remarks:

All data files are in Matlab (.mat) format. **If using this data, please include proper acknowledgement by referencing:**

DOI: 10.5065/D6GM85Q0

Sample citation following ESIP guidelines:

Davison, J. 2017. KDDC Enhanced Bragg Scattering Layer Data. Version 1.0. UCAR/NCAR - Earth Observing Laboratory. https://doi.org/10.5065/D6GM85Q0. Accessed 23 Jan 2017.

For additional citation styles see the bottom of the NCAR/EOL data set page:
https://doi.org/10.5065/D6GM85Q0

6.0 References:

https://www.eol.ucar.edu/projects/pecan/documents/UsingBSLdiagrams.pdf

Davison J. L., R. M. Rauber, and L. Di Girolamo, 2013: A revised conceptual model of the tropical marine boundary layer. Part II: Detecting relative humidity layers using Bragg scattering from S-band radar, J. Atmos. Sci., 70, 3025-3046.

Acknowledgements:

Thanks are given to Mike Dixon for creating pared down versions of the incoming radar files and Doug Davison for creating example VB scripts for downloading and uploading data, both of which were important for the success of this first attempt at remote, real-time EBSL data generation. Original radar data provided by the National Weather Service. NOAA's NEXRAD radar program is a tri-agency effort with NOAA, the Federal Aviation Administration, and the United States Air Force. This data was produced as part of an NSF Atmospheric and Geospace Sciences Post-doc, Award #1331291.