EECRA Update 1971 - 2009

May 2012

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History & Description

The land-based Extended Edited Cloud Reports Archive (EECRA) begins in 1971 and is now updated through 2009. The update contains approximately 65 million processed synoptic reports, bringing the total number of processed observations to 380 million. The EECRA is based solely on visual cloud observations from weather stations, reported in the WMO synoptic code (WMO, 1974). Reports must contain cloud-type information to be included in the archive. Past data sources include

those from the Fleet Numerical Oceanographic Center (FNOC, 1971-1976) and the National Centers for Environmental Prediction (NCEP, 1977-1996). This update uses data from a new source, the 'Integrated Surface Database' (ISD, 1997-2009; Smith et al., 2011). Our past analyses of the EECRA identified a subset of 5388 weather stations that were determined to produce reliable day and night observations of cloud amount and type. The update contains observations only from this subset of stations. Details concerning processing, previous problems, contents, and comments are available in the archive's original documentation (Hahn & Warren 2009)

As automation of weather reports has become more prevalent, a decrease in the number of synoptic observations has been observed. Since the mid-1990's three countries (USA, Canada, New Zealand) have phased out human cloud observations in favor of observations taken by automated systems (laser ceilometer). These new, automated cloud observations are irreconcilable with past data, so were rejected when creating this archive. Over the span of this update the decrease in the number of useable observations per year is about 20%, from 5.7 million observations in 1997 to 4.7 million observations in 2009.

Source Data Problems/Comments

- Only observations labeled 'FM-12' – surface synoptic reports – in the ISD record are used in this study. Though other observation types may contain valid synoptic observations, a study of the relative frequency of N-values (total cloud cover) showed evidence of biases due to infiltration of reports from automated observing systems.

- Though the ISD offers observations at all available hours at our stations, nearly all *synoptic* observations are made at UTC hours divisible by 3. Only these synoptic observations are used in the update (UTC 0, 3, 6, 9, 12, 15, 18, 21).

- Occasionally the ISD archive is missing data at certain hours for certain stations. There does not seem to be a systematic problem, just differences in source data.

- When overlapping observations between the ISD and the original EECRA were compared for years 1987-1996, some stations in Australia showed differences in reporting time for otherwise identical observations. The discrepancy was either one or two hours. Since it cannot be determined which of these were 'truth', the existing EECRA was chosen as the standard (for continuity's sake) and the times at the affected stations were changed in the ISD data. This problem appeared in 64 stations – all in Australia.

In the following examples the ISD observation is shown above the EECRA observation from our earlier archive. For the final processing, the '11' is changed to a '12' in the first comparison and the '17' is changed to an '18' in the second. The third example is offset by two hours, so the '16' is changed to an '18'. These offsets appeared consistent throughout the duration of the station records. The differences shown in lunar illuminance are due to the differences in reported times. The corrected data show agreement in lunar illuminance.

```
19890902110 -52214580940141 37 4 5 4 0 2  060003 0-412  -010104  0000 254 16  12
  890902120 -52214580940141 37 4 5 4 0 2  060003 0-560   010104  0  0 254 16  1211
```

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19890902170 -52214580940141256 3 5 5 7 290090099 0-493  -010095  0000 900900  12
  8909021800 -52214580940141256 3 5 5 7 290090099 0-344   010095  0  0 230900  1211

19950901160-343711512946011 26 6 5 2 0 0  0  000 0-635   110139 82310 139 52  14
  9509011800-343711512946011 26 6 5 2 0 0  0  000 0-551  -210116 98300 144 46  1411
```

Data Format Changes

- The order in which observations are listed has changed in the update. Previously, observations for each hour were grouped together, then organized by station. Due to the way the ISD is organized, observations are now grouped first by station , listing all observations chronologically at each station in a given month, then moving on to the next station.

- The format of the land data has been altered to allow for a 4-digit year. To make this change and keep the file size consistent, two variables have been removed: the wind speed indicator (IW) and the sea level pressure flag (IP). The new format is otherwise identical to the previous format for land data, shown in table 9 of the original report. This update maintains the 80-character format even though the updated ocean EECRA has been expanded to a 98-character format.

- Also changed is the processing of relative lunar illuminance (RI). To save processing time, RI was only computed when needed (when there was insufficient sunlight to produce a brightness indicator (IB) of 1). RI values are set to a missing value code: '9999' when not computed.

References

Hahn, C. J., and S. G. Warren, 2009: Extended Edited Cloud Reports from Ships and Land Stations over the Globe, 1952-1996 (2009 update). Carbon Dioxide Information Analysis Center Numerical Data Package NDP-026C, 79pp.

Smith, A., N. Lott, and R. Vose, 2011: The Integrated Surface Database: Recent developments and partnerships. *Bull. Amer. Meteor. Soc.*, **92**, 704-708.

WMO, 1974: Manual on Codes. Vol. 1., World Meteorological Organization Publication 306, 348 pp.