The *Eversleigh* Historical Meteorological Data Set, Part 2: Data Transformation and Quality Assessment

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Introduction

• Introduction to Algernon Belfield and the *Eversleigh* data set on Part 1 poster (Thornton *et al.*, C14)

• In this second part, we describe the methods used to digitise, transform and quality control Algernon Belfield’s historical dataset.

• *Eversleigh* is 16 km WNW of Armidale, NSW

• Measurements taken between 1877 and 1922, but we start in 1882 because 1879-1881 are missing
Raw Data Format
# Meteorological Data Measured

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached Temperature</td>
<td>Attached to the barometer; used to calculate Sea Level Pressure</td>
</tr>
<tr>
<td>Barometer (Station Pressure)</td>
<td>Located inside the house, inches of Mercury</td>
</tr>
<tr>
<td>Dry Bulb Temp</td>
<td>°F</td>
</tr>
<tr>
<td>Wet Bulb Temp</td>
<td>°F</td>
</tr>
<tr>
<td>Maximum Temp</td>
<td>°F, Previous 24 hours</td>
</tr>
<tr>
<td>Minimum Temp</td>
<td>°F, Previous 24 hours</td>
</tr>
<tr>
<td>Rainfall</td>
<td>Points, Previous 24 hours to 0900</td>
</tr>
<tr>
<td>Wind Direction</td>
<td>Compass direction estimate</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>Beaufort Wind Scale</td>
</tr>
<tr>
<td>Cloud cover</td>
<td>Tenths of sky cover</td>
</tr>
<tr>
<td>Weather description</td>
<td>Brief comments about conditions (irregular recording)</td>
</tr>
</tbody>
</table>
Crowd Sourcing for Spreadsheet Entry

- Twenty-five volunteers via crowd-sourcing
- Given on-line access through UON’s OwnCloud (online file sharing)
- Entry format information provided
- Format change, January 1908
Spreadsheet Entry QA

• QA by three members of the research team
• Time line graphs of data pairs
• Data problems identified:
  – Peak and trough cross-check
  – Occasional incorrect entry into spreadsheet
  – Rare incorrect data in logbook column
  – Handwriting interpretation (i.e. 7 vs 1)
  – Blank rainfall indicates 0 after 1907
  – Wind direction recorded when speed = 0
• Overall about 0.8% of the data set had to be corrected
Other QA Considerations

• Instrument siting
  – Barometer (and attached thermometer) located inside the house
  – Box with thermometers open on one side (South)
  – Trees and buildings interfered with wind estimates
  – Rain gauge baffled to minimise wind influence

• Reasons for missing data
  – Damaged equipment (min temp thermometer)
  – Belfield illness (especially 1921, 1922)
Metric Transformation

• Transformed data to metric using a specialised program written in R
• Sea Level Pressure calculated from Station Pressure and Attached Temperature (Accuracy?)
• The wind direction transformed to compass degrees
• Beaufort wind speed categories to speed values
• Further QA using R ClimDex (http://www.c3.urv.cat/data/manual/Manual_rclimdex_extraQC.r.pdf)
Measurement Procedure Changes

- 1882-1907 procedures changed after 1907 (formation of BOM)

- Biggest impact on wind estimates
  - Wind force levels increased from 6 to 12
  - Wind direction increased from 8 to 16 compass points
Wind QA (Using Anomalies)

ANNUAL WIND DIRECTION ANOMALIES
EVERSLEIGH

ANNUAL WIND SPEED ANOMALIES EVERSLEIGH
Comparisons with Other BOM Stations

- Annual rainfall correlations with 5 other locations on NE plateau, R2 ranged between 0.70 to 0.84.
  Example:

  \[ y = 1.0183x - 26.494 \]
  \[ R^2 = 0.812 \]
Comparisons with Armidale PO

- **Annual and Seasonal Max Temp**

  **Armidale vs Eversleigh Annual Ave Max Temp**

  \[ y = 0.623x + 7.4488 \]

  \[ R^2 = 0.51242 \]

  **EverJJA vs Arm JJA MAX TEMP 1882-1992**

  \[ y = 0.846x + 1.235 \]

  \[ R^2 = 0.49203 \]
Conclusions

• *Eversleigh* measurements generally high quality
• Should be acceptable for BOM with provisos
• Biggest problem is the wind data
• Some question about MSLP calculations
• Next stage is analysis for weather and climate using circulation indices (*see Linden et al. poster, C9*)
Acknowledgements

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QUESTIONS?