The Development of an Enhanced Tropical Cyclone Tracks Database for the Southwest Pacific from 1840-2009

Briefing for the “3rd ACRE Workshop”

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Agenda

- Area of Study
- Limitations
- Data Sources
- Collaborative Institutions
- Methodology

- International Best Tracks Archive for Climate Stewardship - IBTrACS
Area of Study

- Latitude 5-40° S; Longitude 135° E; including the Gulf of Carpentaria (Zones Z3 and Z4)
Selection of Area of Study Based on Climatology

Average annual profile of tropical cyclone longitude crossings for the Southern Hemisphere (Natural Break at 135° East) – Kulessnov, 2006
Limitations

- Data, Data, Data!
- Reliable satellite data with TC track and intensity information is relatively new
- Satellite era essentially begins in 1969; but reliable intensity information begins in the 1982-83 timeframe
- A good % of the data that does exist is not climate quality (e.g., homogeneous); this presents problems in drawing historical relationships to correlating changes to what is happening today
- Possible discontinuities in the record from different monitoring centre procedures involved in classification of TCs
Data Sources

• Satellite Data Record begins in 1969
• Australian Bureau of Meteorology TC Database
• NZ Met Service and NIWA TC Databases
• Paper track and intensity data prior to 1969
  • NZ Met Service and New Caledonia
  • Solomon Islands
  • Cook Islands
  • Fiji
  • Others?? Looking for any non-digital TC data sources that can be included (e.g., tracks, intensity, etc. prior to 1969)
• Other data related to TCs
  • Identification of TCs along the South Pacific Convergence Zone; looking to identify storms that might not have been identified before—e.g., either as a TC itself, or Cat 3-5 storms not previously identified
  • Teleconnections (e.g., El Nino/La Nina)
  • Extreme precipitation events
  • Sea Surface Temperature (SST)
Collaborative Institutions

- Australian Bureau of Meteorology
- International Pacific Research Center
- Regional Meteorological Service Directors
  - Cook Islands Meteorological Service
  - Fiji Meteorological Service
  - MeteoFrance in French Polynesia and New Caledonia
  - Samoa Meteorological Service
  - Solomon Islands Meteorological Service
  - Tongan Meteorological Service
  - Vanuatu Meteorological Service
- NZ Meteorological Service
- NZ National Institute of Water and Atmosphere (NIWA)
- Secretariat of the Pacific Regional Environment Programme
- South Pacific Applied Geosciences Commission
- University of Guam
- University of Hawaii
- University of Melbourne
NEW Caledonia
New Caledonia
Visher, 1925
Visher, 1925

Figure 16.—Map showing tracks of representative Australian hurricanes. (Traced from Australian Daily Weather Maps.)
Adding New Data – SW Pacific Basin: Digitization via ArcGIS is now Complete and will be Added to the Database Soon
More Paper Data – Dating Back into the 1800s

Visher, 1925

Tracks now in Digital Form
Quality Assurance Methodology using GrIT

- GrIT – Graphical Interpretation of Tracks
- Method was developed by Diamond, Lorrey, et al (paper in preparation for IJC) in order to take advantage of freely available Google Earth™ software on the Internet
- It uses a set of objective and subjective criteria to aid in quality controlling the data
- It takes advantage of the most advanced computer known to exist – The Human Brain
- There are three cases of tropical cyclone track morphology variants that can be identified using GrIT.
  - (a) non-replicated tracks – single storms
  - (b) replicated tracks - having similar spatial and temporal characteristics (start and stop) within a 7-day window
  - (c) erroneous or extraneous tracks with divergent points
- Independent analysis and consultation by at least 3 independent persons to compare GrIT analysis results
Beginning of the 1955-56 season – Dec 1955

Jan 1956

Feb 1956

Mar 1956
Full 1955-56 season – April 1956
85 storms – (obvious duplicates)
### GrIT Worksheet

<table>
<thead>
<tr>
<th>Storm Groupings</th>
<th>Storms to Delete</th>
<th>Storms to Modify or Add</th>
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</thead>
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<td>1</td>
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<tr>
<td>21, 31, 32, 34, 36, 37, 38, 51</td>
<td>20 first flood 22 flood surge</td>
<td>215</td>
</tr>
<tr>
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</tr>
<tr>
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<td>100%</td>
<td>6</td>
</tr>
</tbody>
</table>

**Season:** 1950
What is IBTrACS?

- First publicly available global tropical cyclone best track dataset.
  - Users no longer need to get or merge data from disparate sources.
- Utilizes complex merging techniques.
  - Accounts for inherent differences in best track datasets.
- Includes quality control
  - Position, time, wind, and pressure
- Averages positions and intensities from all available agencies.
  - Impossible to determine which agency was “correct” without a global reanalysis.
- Provides full range of reported values for intensity and position every 6 hours.
- The most comprehensive global best track dataset available.
Storms unique to IBTrACS (1947-2007)

NET GAIN: 150+ tropical cyclones!
Why use IBTrACS?

- Combines data from 12 best track datasets
  - Scalable to include new datasets

- Includes quality flags, statistical variance, and range of values for wind and pressure

- Contains the most complete set of cyclones available

- Routinely updated

- Data is provided in numerous formats:
  - NOAA Tape, WMO, cXML, CSV, WFS, GIS

- Cross-referenced storm look-up table
IBTrACS Web Site
http://www.ncdc.noaa.gov oa/ibtracs

E-mail: IBTrACS.Manager@noaa.gov
South Pacific Rainfall Atlas (SPRAT) – An Application of IBTrACS to Research
The WDC site can be accessed at: http://wdca-meteorology.org
The GOSIC Portal provides convenient, central, one-stop access to data and information identified by the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS) and their partner programs, such as the Global Atmosphere Watch (GAW) and regional observing systems, such as the GOOS Regional Alliances (GRA). More information on the GCOS and the GOSIC Portal.

## How do I find Climate Datasets Quickly?

- **Search Data by GCOS Essential Climate Variables** (e.g. Temperature, Precipitation, Sea Surface Temperature, etc.)
- **Search Global Observing Data on the GOSIC Portal**
- **Search using Data Access Matrices** (provides quick access to data download by variable, theme or program)
- **Text Search** (in the process of being updated)

## Access to Observing System Data, Metadata and Information

- **GCOS - Global Climate Observing System**
- **GAW - Global Atmosphere Watch**
- **GTOS - Global Terrestrial Observing System**
- **GOOS - Global Ocean Observing System**
- **GRA - GOOS Regional Alliances**
- **Global Observing Systems Metadata**
- **Maps and Google EarthKML Products**
- **Publications** (search by observing system, year or title keyword, cross referenced by GCOS, GOOS, GTOS, GAW, WMO and UN ID (1985 to present))
- **GEO - Group on Earth Observations**

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The GOSIC Portal can be accessed at: http://GOSIC.ORG
Thank you – Any Question??

Large climate scientist seeing what the true power of a TC can do.

Large piece of coral moved by TC Heta in Niue in 2004.