Assessing medicane risk using synthetic event sets

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In last Plinius...

To create a database of events

To characterize large-scale meteorological environments for medicane development and maintenance

To examine numerical predictability
Growing the database

1.- Natural process:
   Past: no measurements
   Future: no patient

ONE order the magnitude increased:

<table>
<thead>
<tr>
<th># Events</th>
<th># Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>~10</td>
<td>20</td>
</tr>
<tr>
<td>~100</td>
<td>200</td>
</tr>
</tbody>
</table>

2.- Created by ourselves:

   Machines or dancing
   Other machines (computers) + brains
...using the CHIPS model

Coupled Hurricane Intensity Prediction System

1.- Traditional:
Tracks are initiated, based on historical cyclone data

2.- New:
Genesis by random seeding
Genesis by random seeding

1.- Sowing the seeds

Initial track points are randomly distributed:
These “seeds” are planted everywhere and at all times, SST, season or other factors.

2.- Looking the weather

The ambient flow varies randomly in time, but it is constructed so that its mean, variance, and covariances conform to the climatology.

3.- Analyzing the benefits

Genesis is defined for the synthetic events as the first point at which the maximum winds exceeded 15 m/s.

Emanuel et al. 2008: Emanuel, K., R. Sundararajan and J. Williams; Hurricanes and Global Warming
Some results for HURRICANES

<table>
<thead>
<tr>
<th>Genesis spatial distribution</th>
<th>OBSERVED (1980-2005)</th>
<th>CHIPS MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Map" /></td>
<td><img src="image2.png" alt="Map" /></td>
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<thead>
<tr>
<th>Normalized mutual information</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td><img src="image3.png" alt="Matrix" /></td>
<td><img src="image4.png" alt="Matrix" /></td>
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Emanuel et al. 2008: Emanuel, K., R. Sundararajan and J. Williams; Hurricanes and Global Warming
Emanuel et al. 2005: Emanuel, K., S. Ravela, E. Vivant and C. Risi; A statistical deterministic approach to hurricane risk assessment
Some results for MEDICANES
Some results for MEDICANES
Some results for MEDICANES

Track of 25 random synthetic medicane tracks
Some results for MEDICANES

Radius (km) of maximum circular wind in each event
Some results for MEDICANES

The maximum surface wind speed (m/s) in each event

Radius (km) of maximum circular wind in each event
Conclusions & Further work

Conclusions:
- Using this model, we are able to create a lot of synthetic medicanes to improve the statistical study of these events.
- Statistical results are approaching to observations.

Further work:
- To improve the fit of the parameter values in the CHIPS model.
- To use the climatologies from future scenario data.