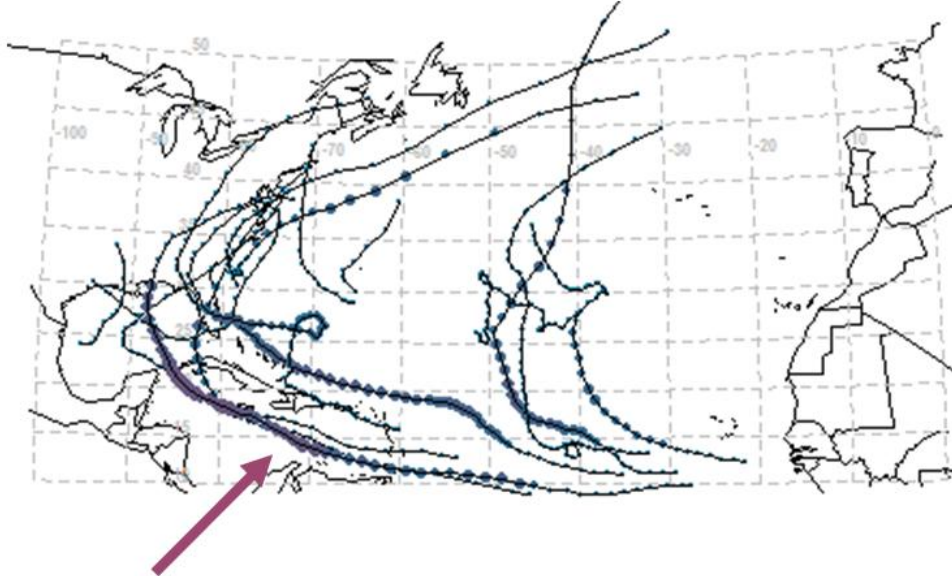# MODELLING HURRICANE TRACK MEMORY

A PROPOSED STUDY GROUP QUESTION FROM LLOYD'S OF LONDON
5 MARCH 2010

BACKGROUND

The hurricane seasons of 2004 and 2005 led to extreme losses for the (re)insurance industry. It appeared as though certain large scale atmospheric structures (such as the "Bermuda High") were steering storms into the US.

2004 HURRICANE SEASON

3 storms following a steering pattern here?

If, under some conditions, hurricane tracks are conditional on either previous hurricanes, or other climate variables this could be very significant for the insurance industry. It would suggest that storms may cluster which would lead to a larger variance in financial results than is typically modelled.

If the conditions for clustering are expected to either be more or less prevalent under a climate changing world – again this is very significant to the insurance industry over the coming decades.

THE QUESTION – HIGH LEVEL

Within a hurricane season – is there a tendency, under some conditions, for groups of hurricane tracks to follow a large scale steering pattern? Can the steering pattern be identified in some sense?   What is the unconditional probability a steering pattern will exist in a given year?   Can this probability be made conditional on large scale climate variables (ENSO etc) with any skill?

THE QUESTION – MORE DETAIL

What geometric algorithms would be appropriate to define whether one storm is "close to" another?   Storms may be generated in different regions but then be funnelled along a large scale steering pattern for a portion of their track. How can we spot the close sections and ignore the part of the track where they diverge? We are most interested in the part of a storm track that is close to US landfall; can we weight this region so it receives more attention?

Does the severity of the storm (proxied by either windspeed or lower central pressure) have any bearing on this (e.g. is a powerful storm more or less likely to follow the steering pattern?). Is a steering pattern more likely to be followed by a fast moving storm or a slow moving one? Do such steering patterns affect the whole East Coast of the US?

AVAILABLE DATA

The HURDAT[1] data set maintained by the US National Oceanographic and Atmospheric Administration contains storm tracks split by six hourly points with data available from 1850 (though data quality after 1950 is more reliable). This will be provided in a database.

Other relevant data may be: sea surface temperatures, atmospheric pressure maps at different heights, various climate indices such as ENSO, NAO, AMO etc. If this problem is accepted we will attempt to acquire these time series.

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[1] http://www.aoml.noaa.gov/hrd/hurdat/Data_Storm.html