

What Can We Say About Hurricanes and Climate Change With Our Present Data?

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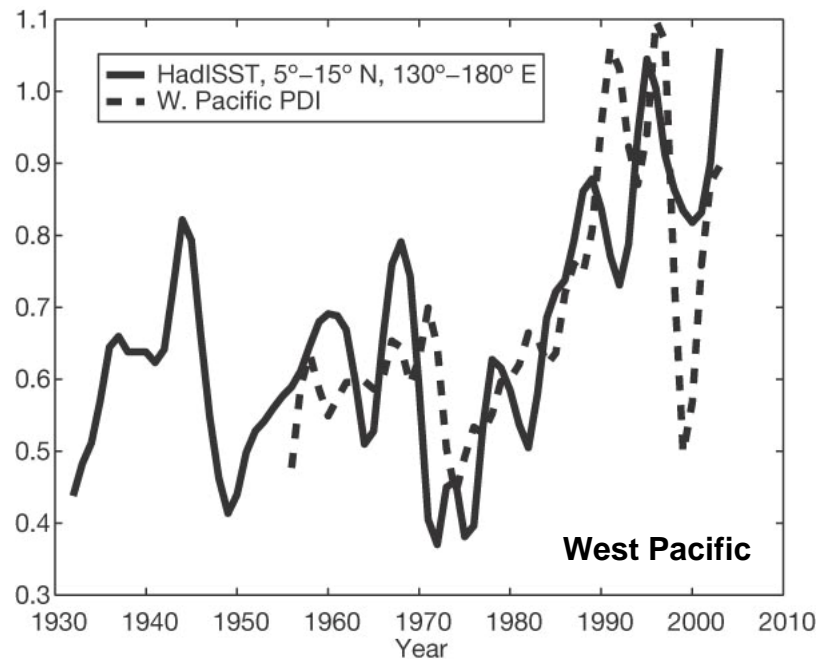
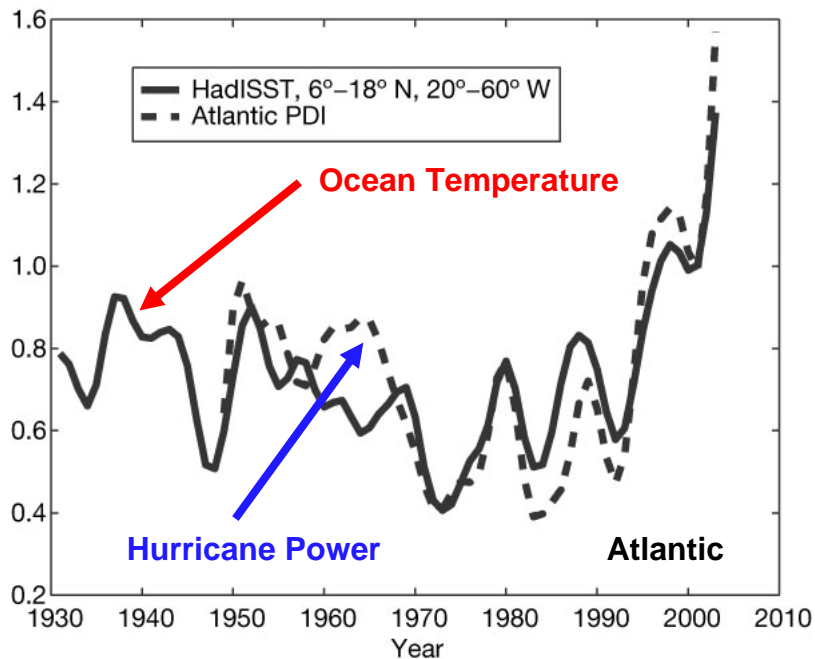
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The past 50 years:

The world's tropical oceans are warming as the air warms.

Our hurricane records suggest that hurricanes are getting stronger in general. This makes sense, but...



Adapted from
Emanuel (2005)

...are our hurricane records good enough to trust?

A Brief History of the Global Hurricane Record

*Here there be
Dragons*

Post WW-II Aircraft
Reconnaissance

Age of the Weather
Satellites

But still ok to sail
here (with caution)

1950's

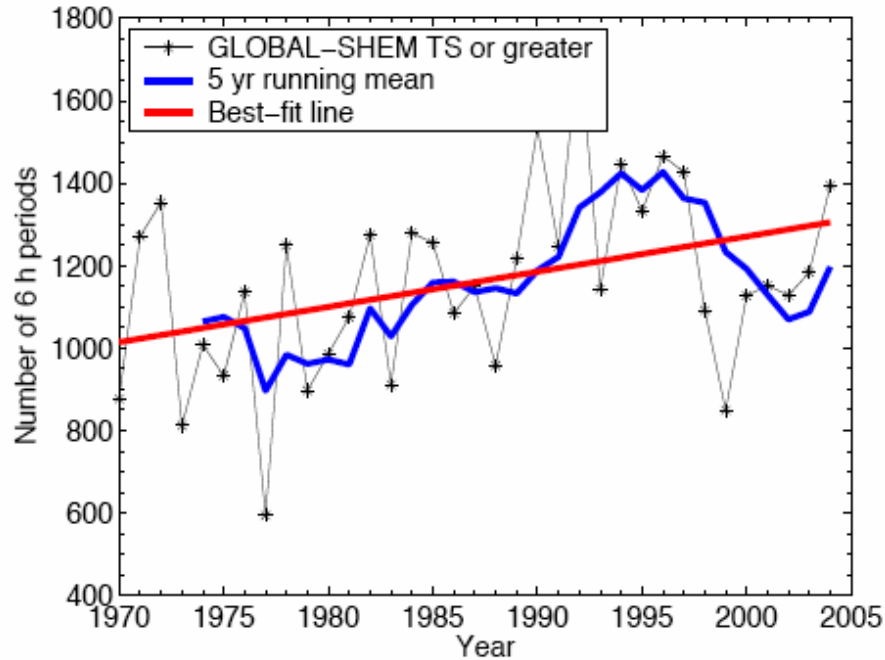
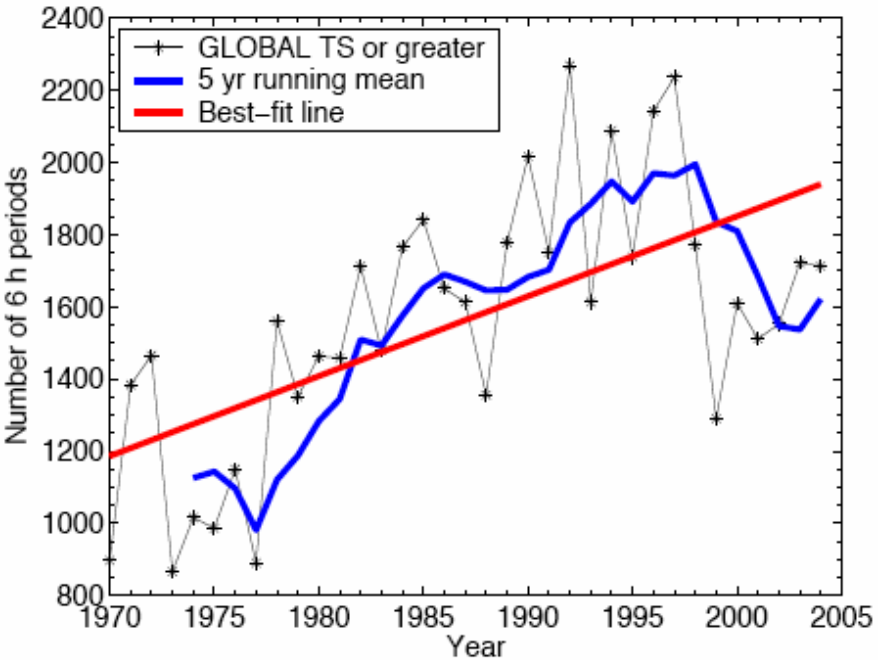
1970's

Occasional measurements.
Serendipitous sources.
Maximum intensity rarely
measured.
Storm counts may be low.

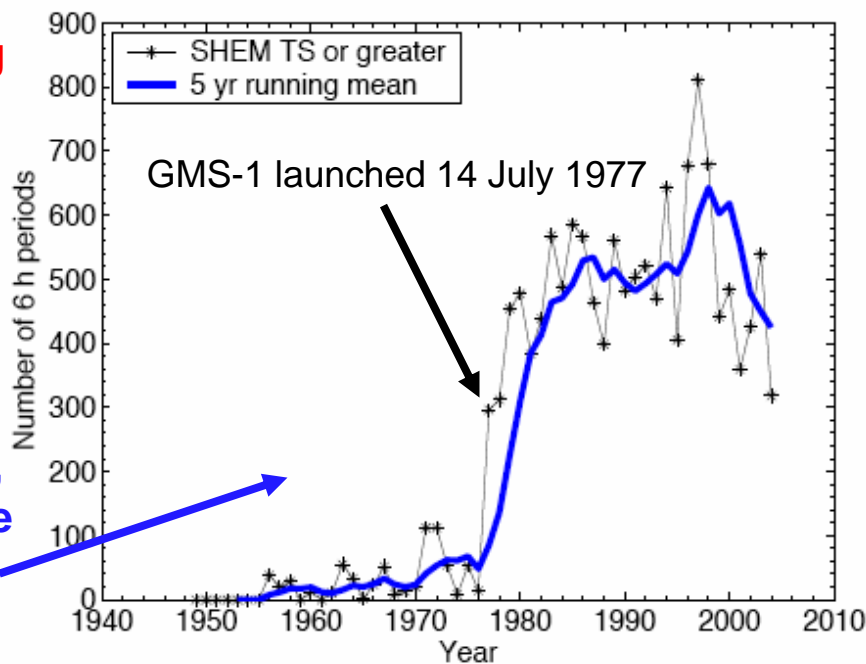
Sporadic measurements.
Mostly Atlantic.
West Pacific until 1987.
Maximum intensity rarely
measured.
Storm counts are better.

Hourly measurements.
Almost global.
The counts are good.

The existing record is inconsistent by its nature and its construction.



Simple example of data inconsistencies inflating a trend.



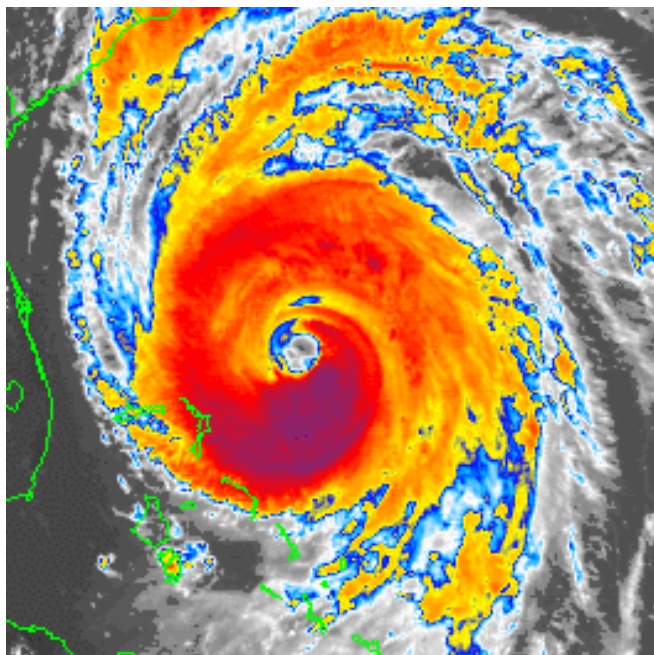
No aircraft, no satellites, lots of open water. We're basically blind here.

How can we construct a more consistent record that doesn't introduce its own trends for the wrong reasons?

Collect all satellite data from around the world.

Reanalyze this data to make it homogeneous.

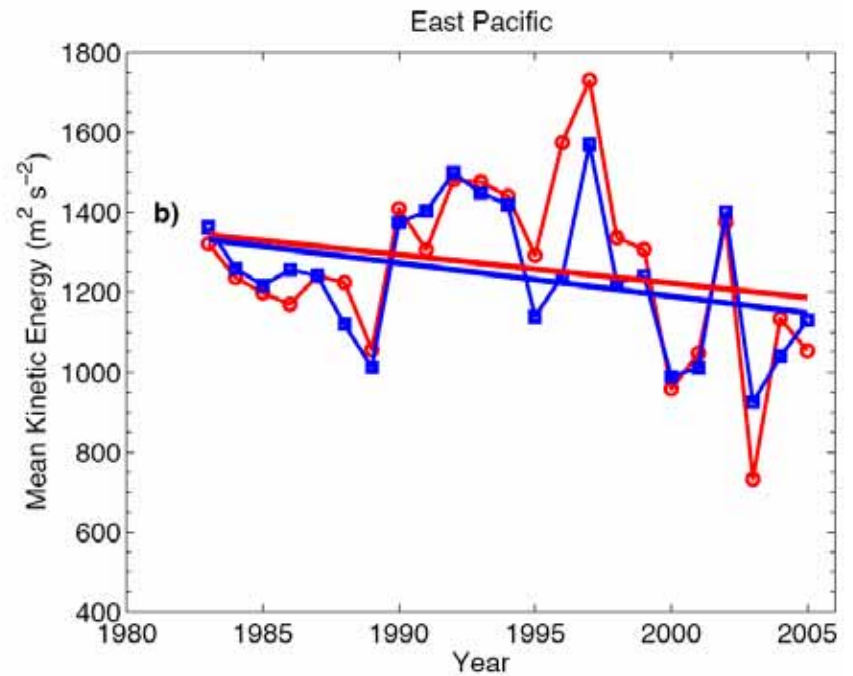
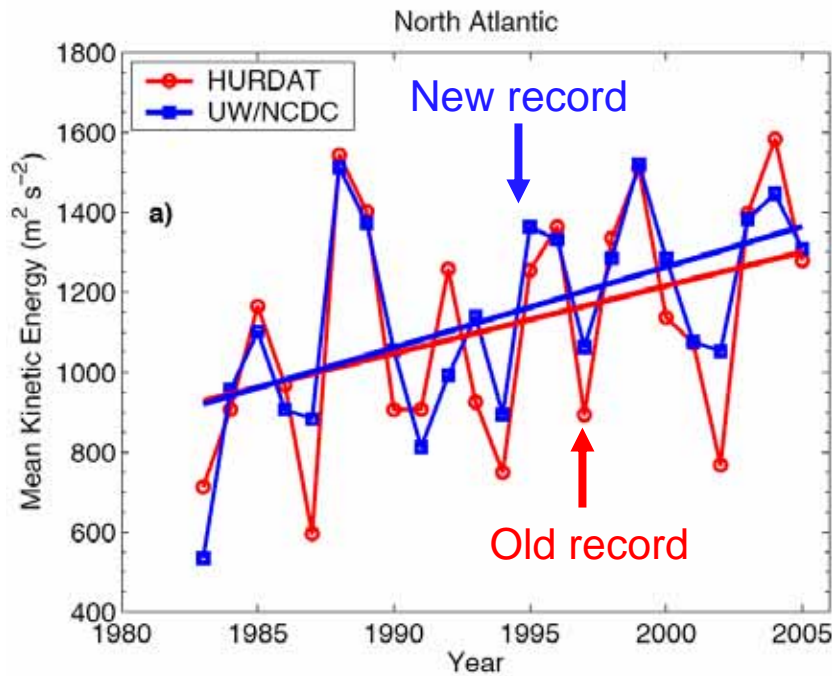
Construct an objective algorithm that estimates hurricane intensity from the satellite data.



Objective
Algorithm

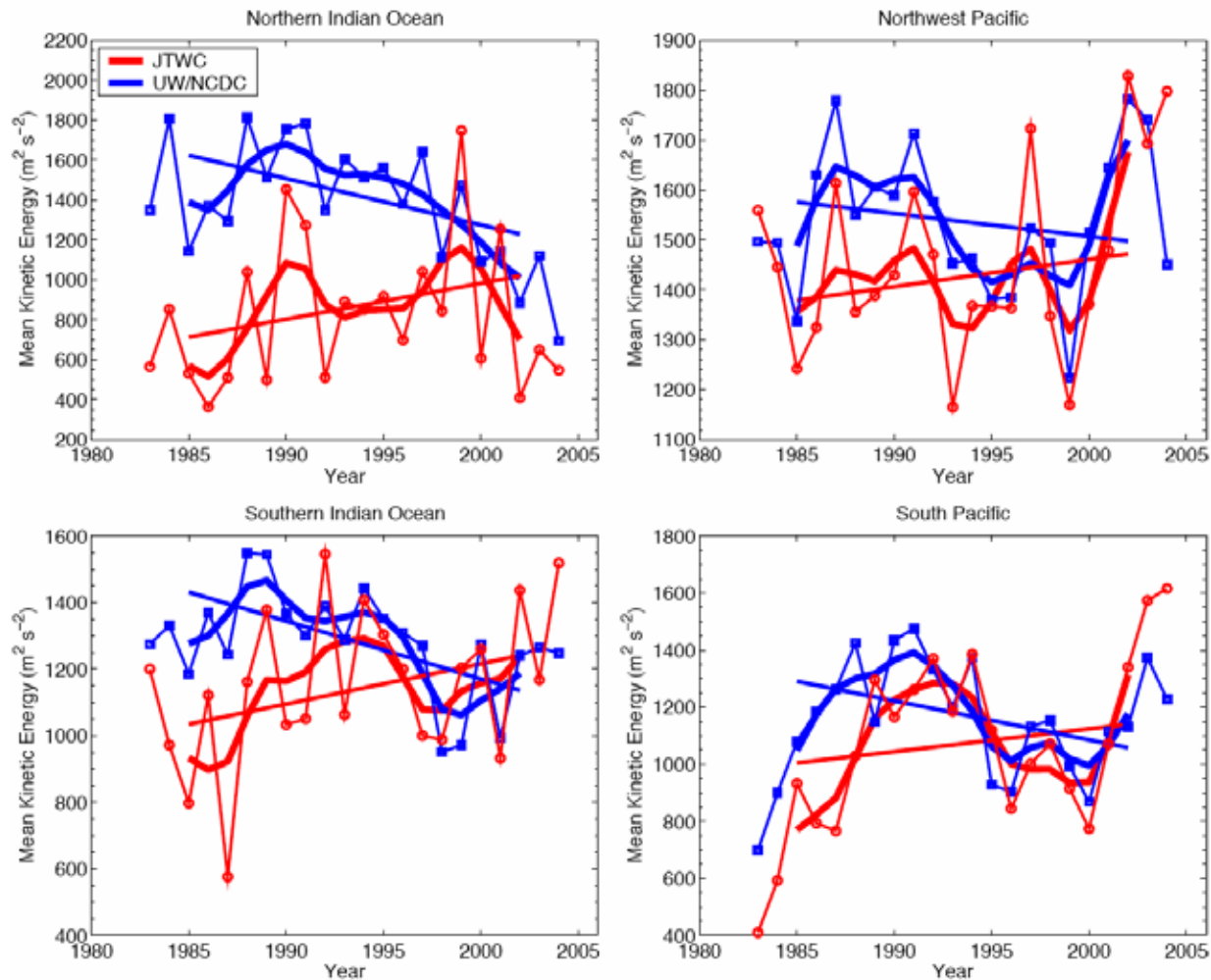
Intensity

How does our new consistent record compare with the present records?



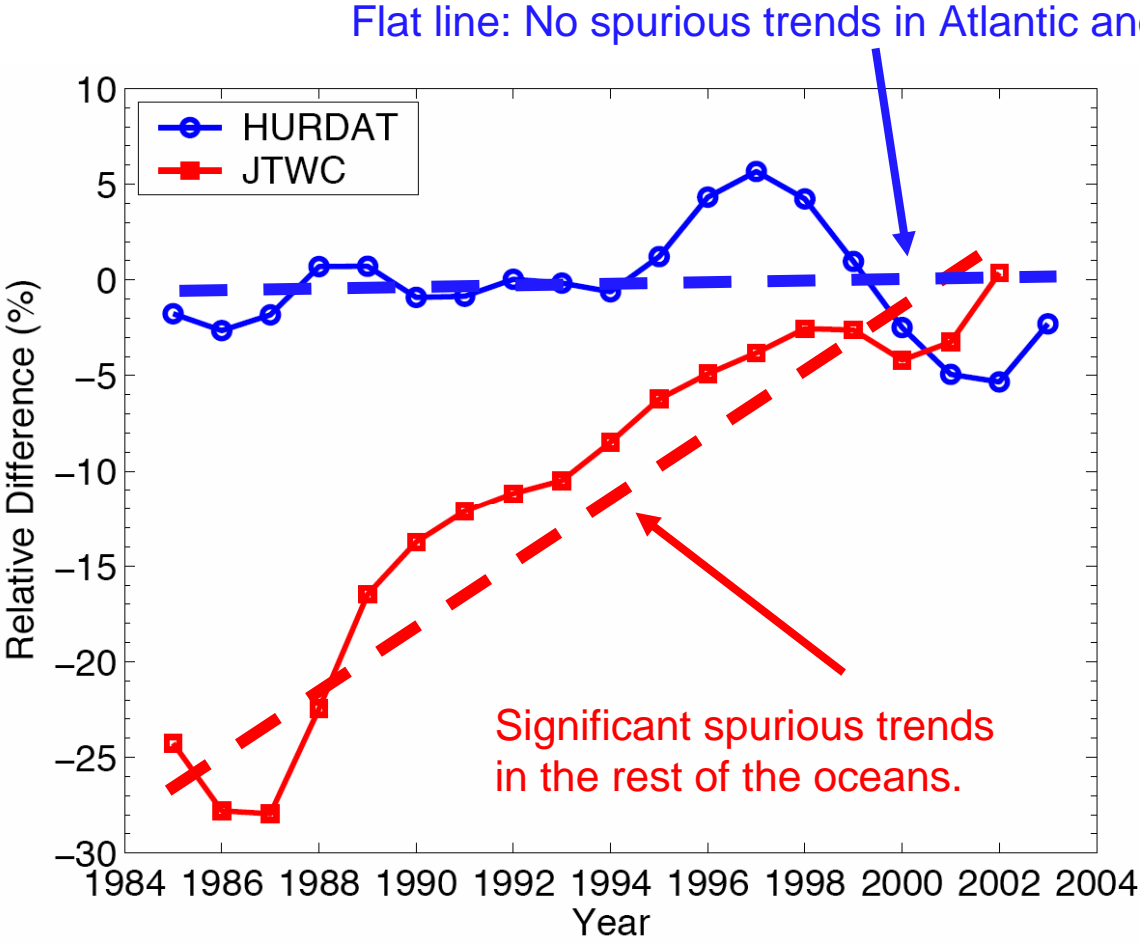
Excellent agreement in the Atlantic and East Pacific!

Terrible agreement everywhere else!



Main Point: the differences grow as we look further back in time.

The differences introduce a *spurious upward trend* in the existing global record.



Summary

The trends in the Atlantic and East Pacific intensity records are well supported by our new record. *Upward* in the Atlantic. *Downward* in the East Pacific.

No upward trends were found in the West Pacific, Northern and Southern Indian, and South Pacific oceans. *The vast majority (85%) of global hurricane activity takes place in these basins.*

Similar warming trends are found everywhere in the tropics. Why is the Atlantic behaving so differently?

If the data are not good enough to accurately measure long-term hurricane behavior, then our path to understanding how hurricanes will change in a warming world must be through *better physical understanding*. This is our present research challenge.