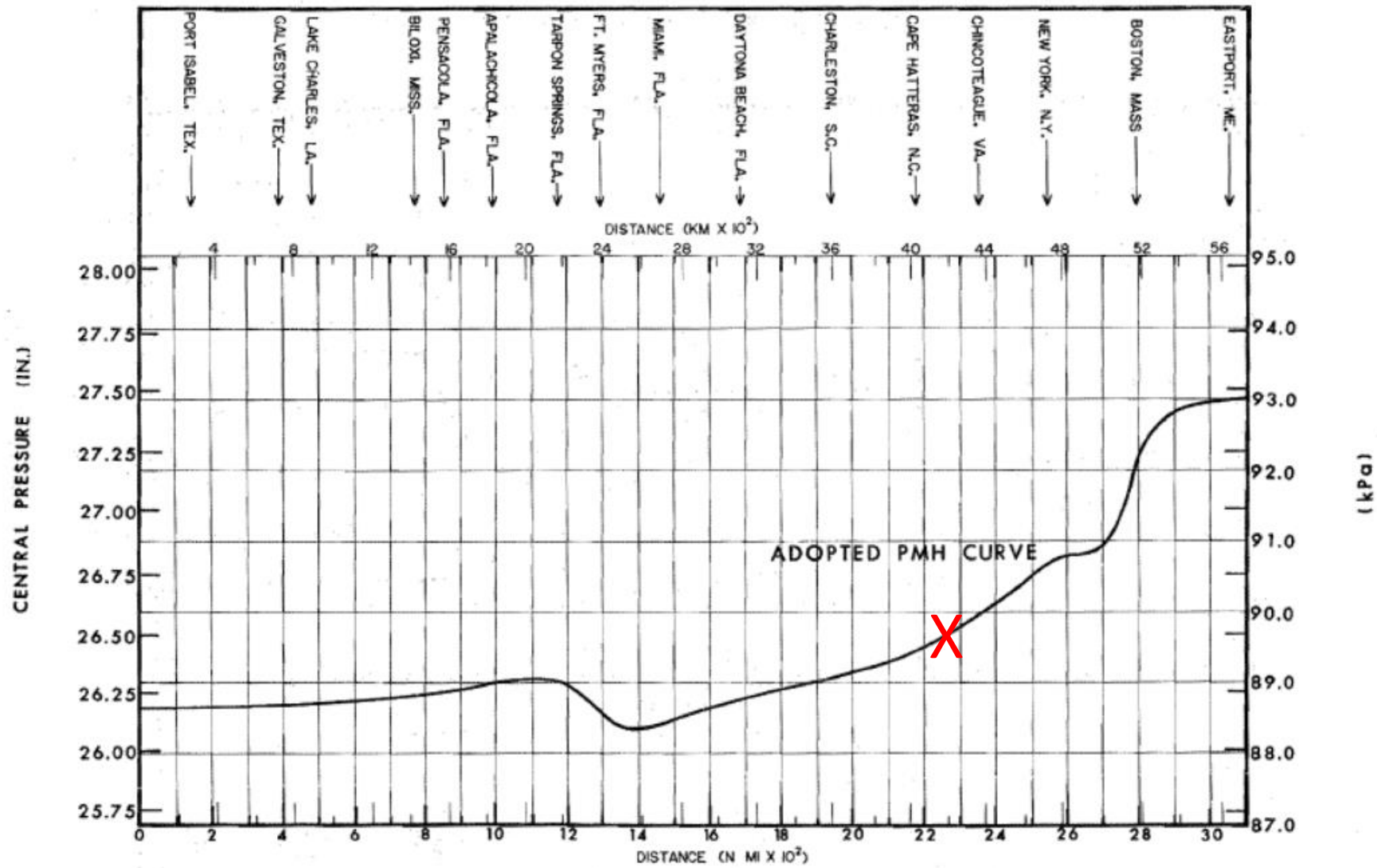


Thresholds to tropical cyclone maximum intensity

- Tropical and subtropical cyclone's peak intensity constrained by water temperature
- Fast-moving mature tropical cyclones can weaken slower over cooler waters if no shear
 - i. Standard project hurricane can be used for broad guidance (Schwerdt et al. 1979)
 - ii. Use "Maximum Potential Intensity" (MPI) theories from Holland (1997) and Emanuel (1988)
 - iii. Assess Kubat (1995) and DeMaria and Kaplan (1994) for higher latitude storms

Central pressure as function of SST



From NWS 23

Central pressure: 897 mb

Figure 2.2.--Plot showing the adopted PMH p_0 .

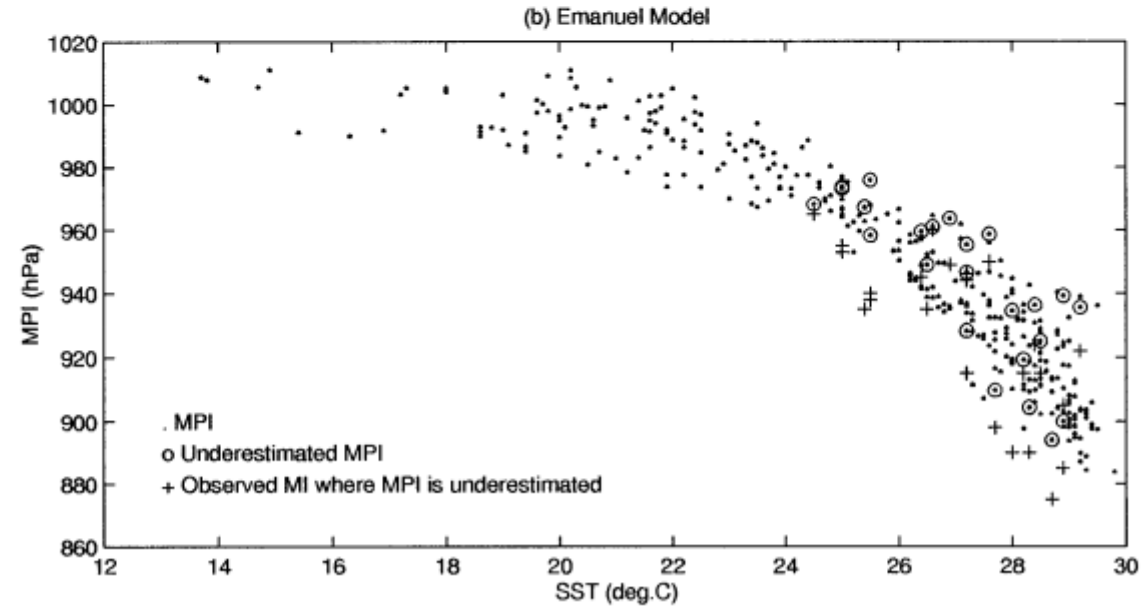
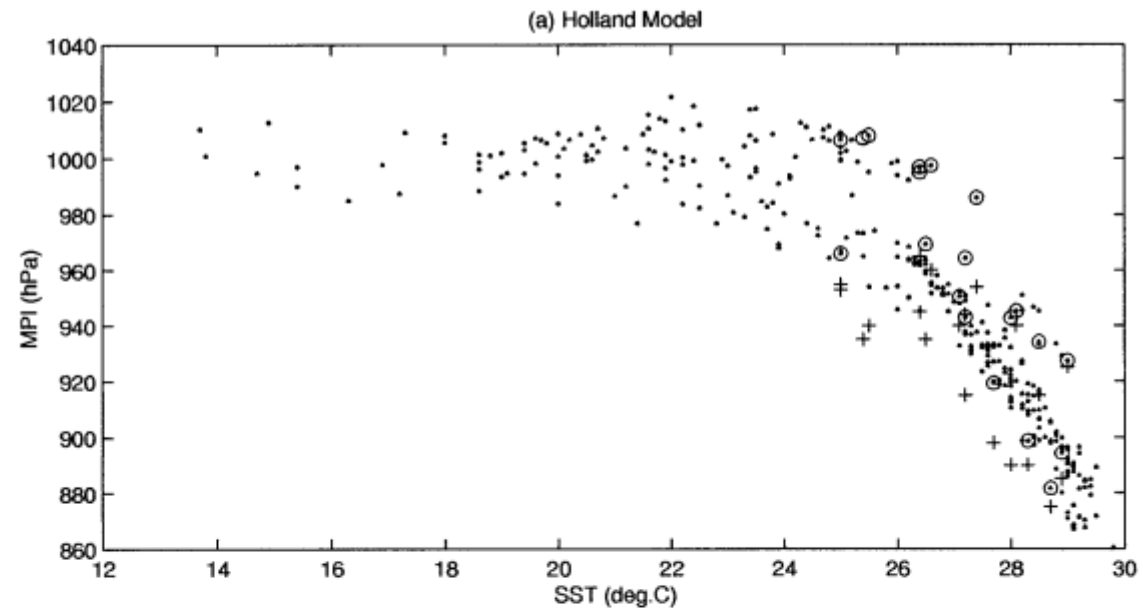


FIG. 9. Each MPI model estimate and the corresponding SST for the (a) H1 and (b) E1. Note the figure also shows the model estimates that were noticeably underestimated and the corresponding maximum observed tropical cyclone intensity.

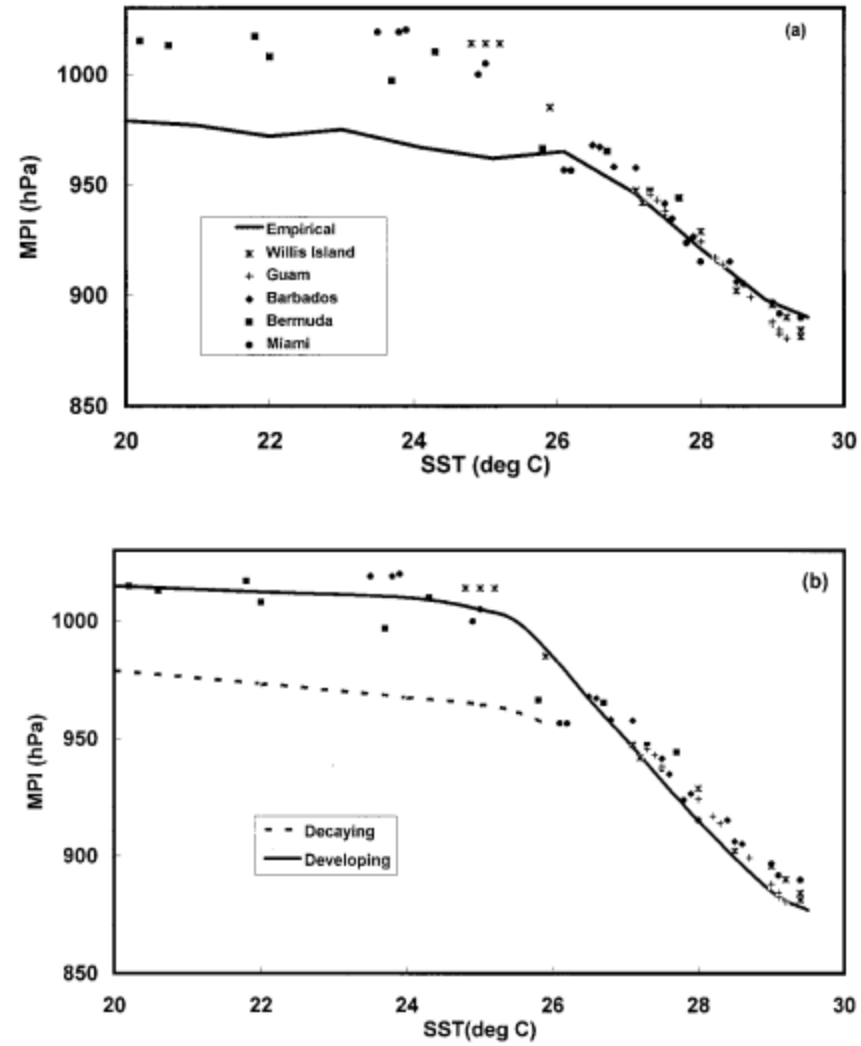


FIG. 12. Scatterplots of the SST variation of MPI estimates from the indicated stations: (a) imposed upon the empirical curve for the North Atlantic derived by DeMaria and Kaplan (1994) and (b) new curves indicating the differences between developing cyclones and those that are decaying while moving over colder water.

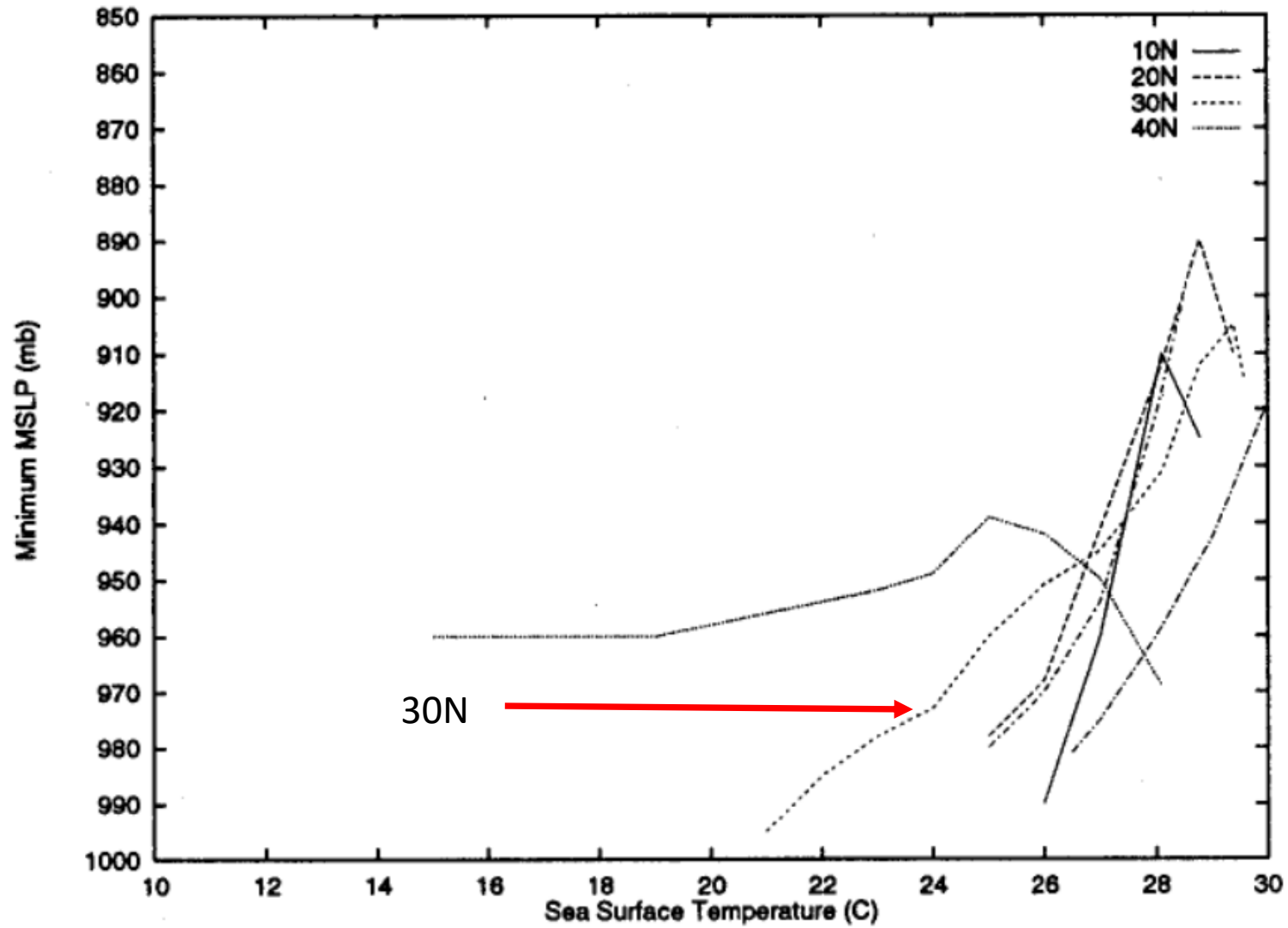


Figure 3.16: Latitudinal variation of minimum MSLP versus SST for the Atlantic basin. The 10 degree wide bands are centered at 10, 20, 30, and 40 degrees north.

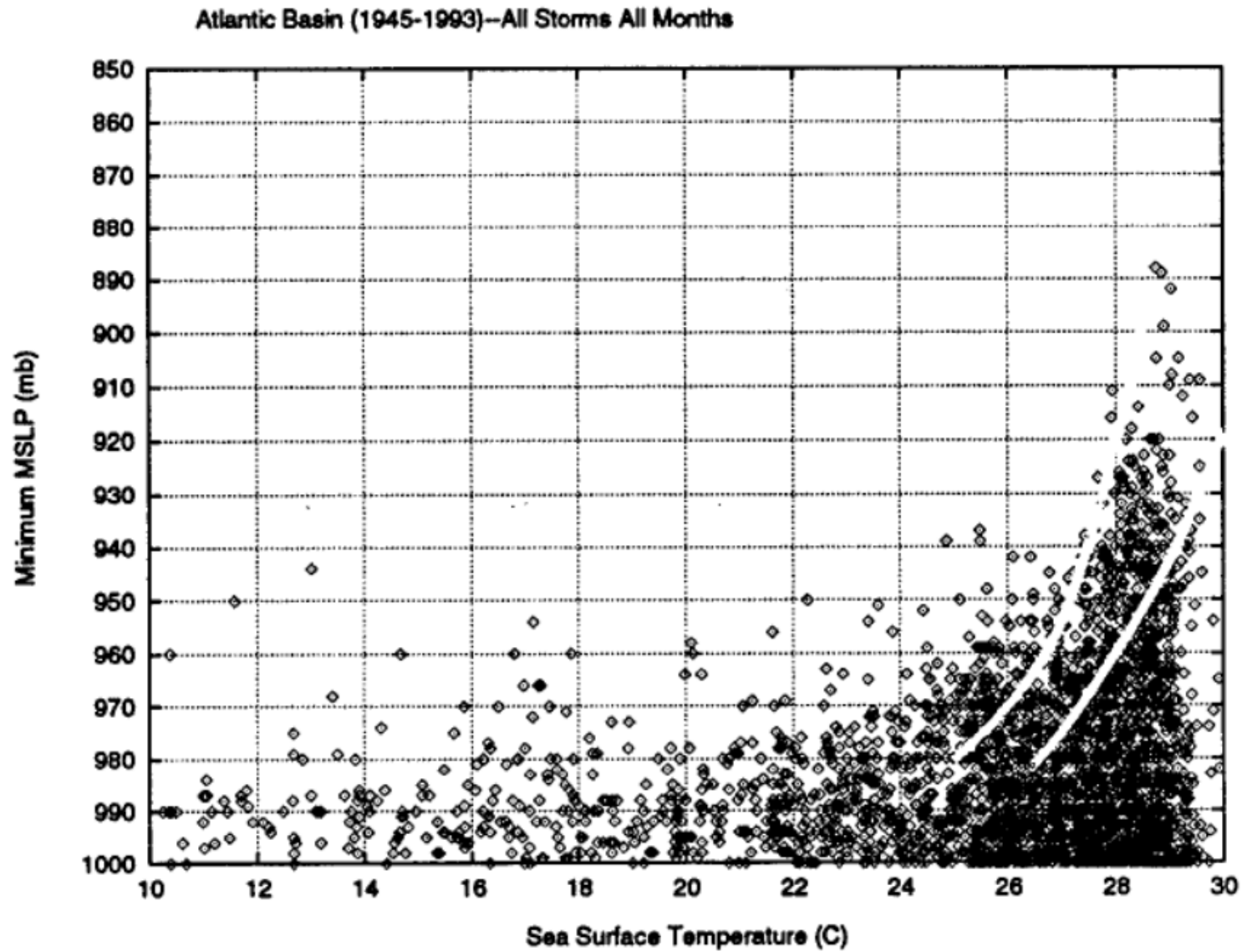


Figure 1.3: Observed intensities (MSLP) for the Atlantic basin with the Miller (1958) and Merrill (1985) curves superimposed. Note the underestimation of MPI by each MPI curve.

Maximum sustained winds V_{\max} as function of SST

All figures from Evans (1993) except East Pac, which is from Whitney and Hobgood (1997)

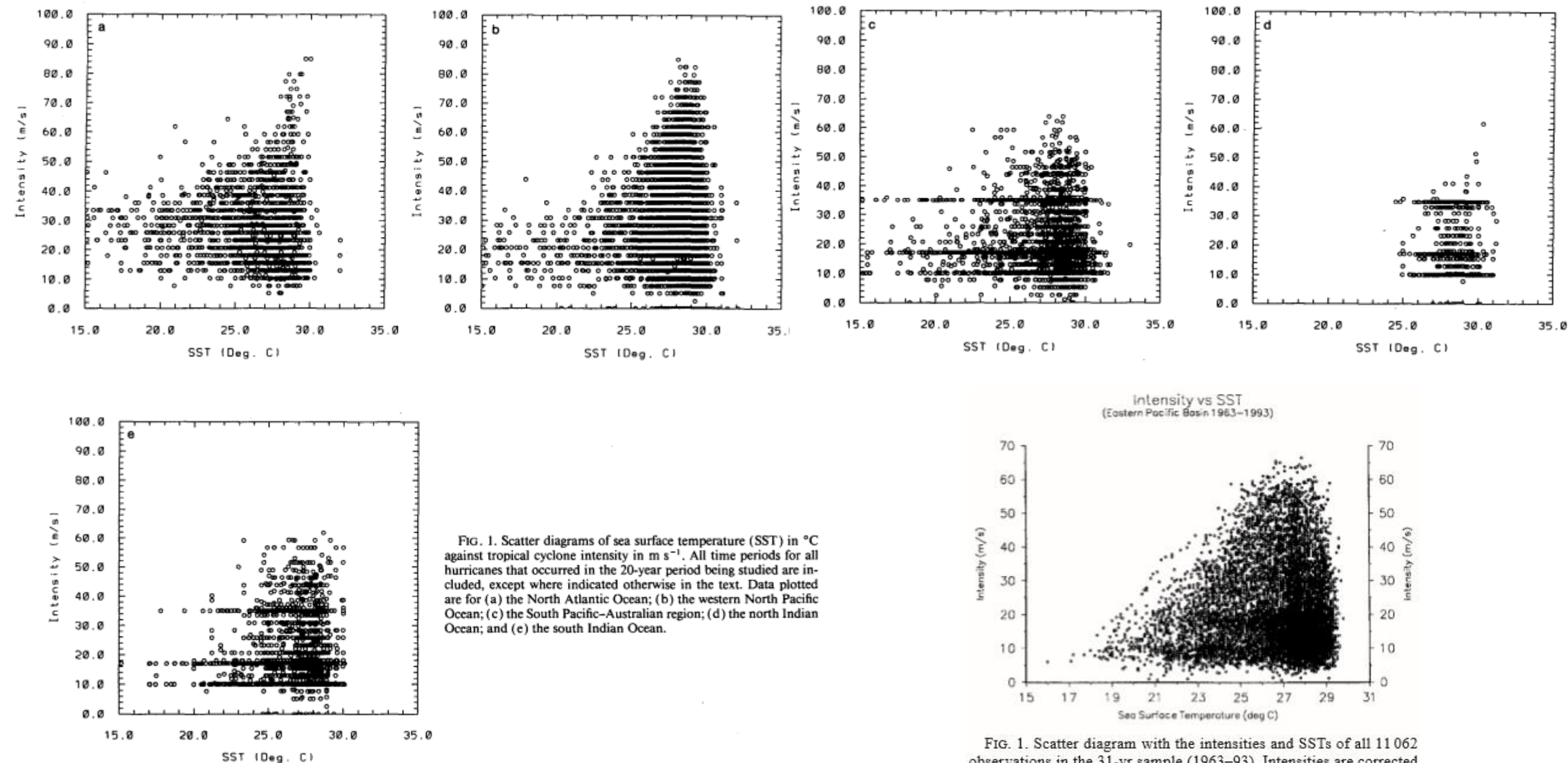


FIG. 1. Scatter diagrams of sea surface temperature (SST) in $^{\circ}\text{C}$ against tropical cyclone intensity in m s^{-1} . All time periods for all hurricanes that occurred in the 20-year period being studied are included, except where indicated otherwise in the text. Data plotted are for (a) the North Atlantic Ocean; (b) the western North Pacific Ocean; (c) the South Pacific-Australian region; (d) the north Indian Ocean; and (e) the south Indian Ocean.

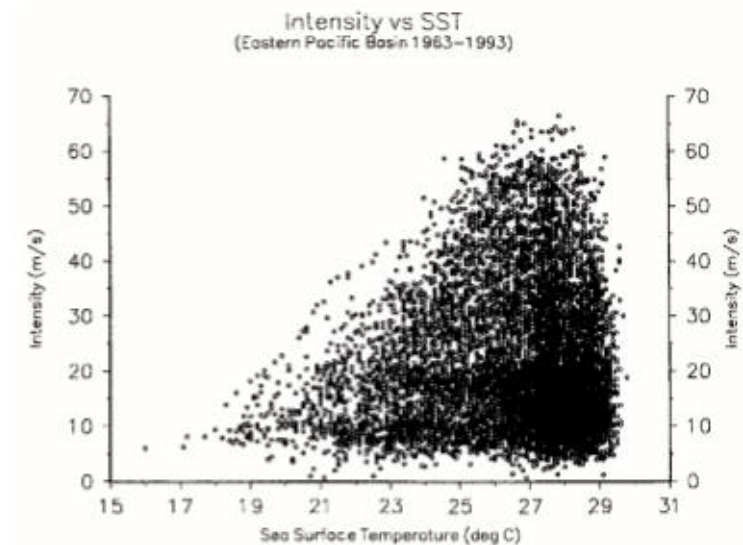
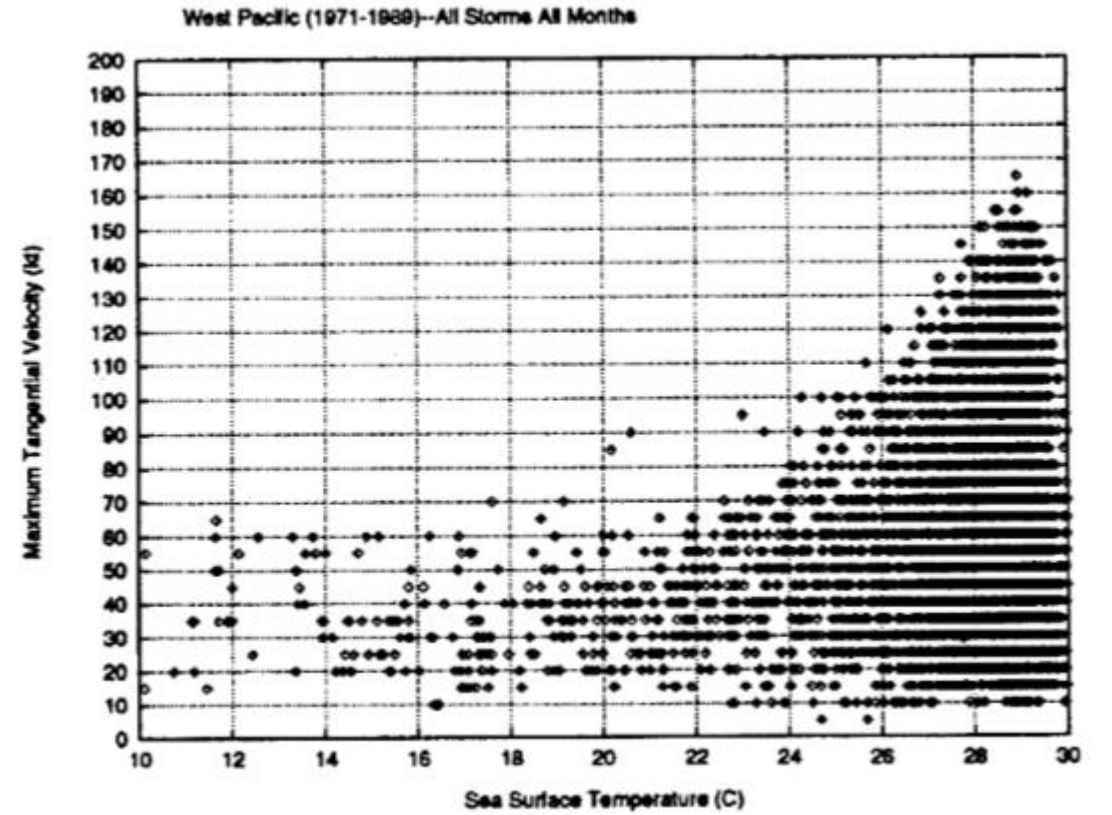
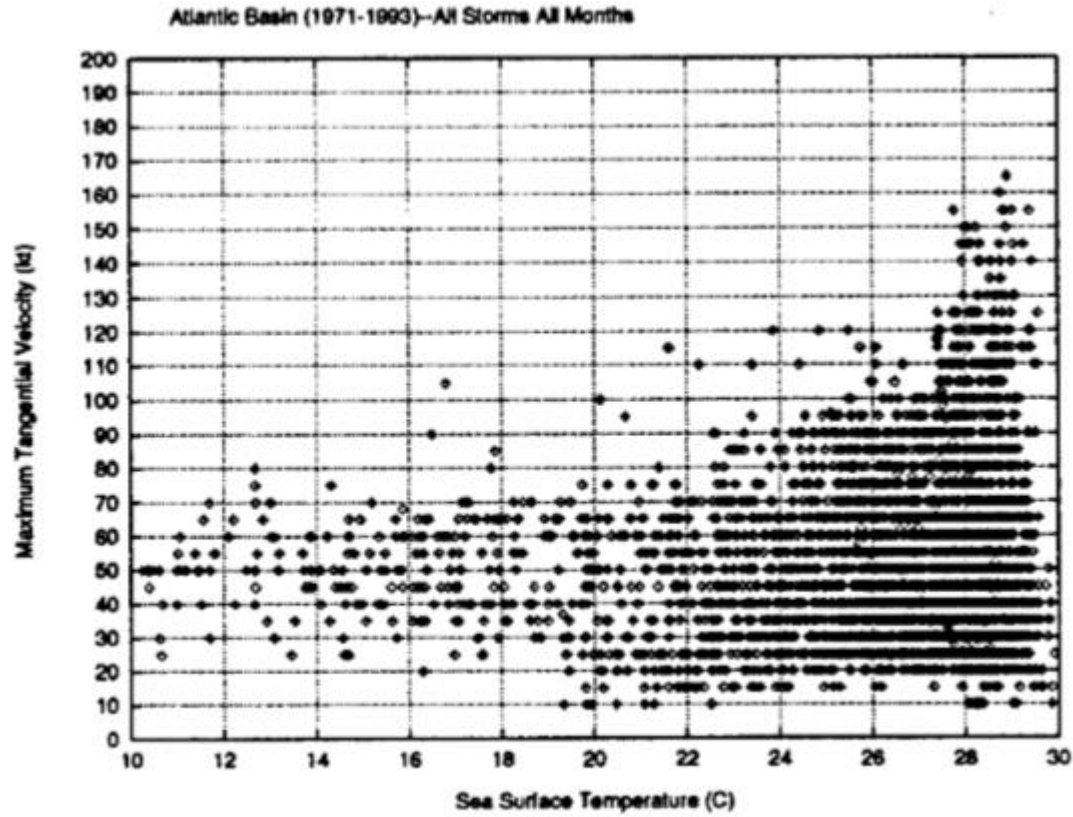


FIG. 1. Scatter diagram with the intensities and SSTs of all 11 062 observations in the 31-yr sample (1963-93). Intensities are corrected for storm translational speed.

From Kubat (1995)



Evans, adapted from Merrill

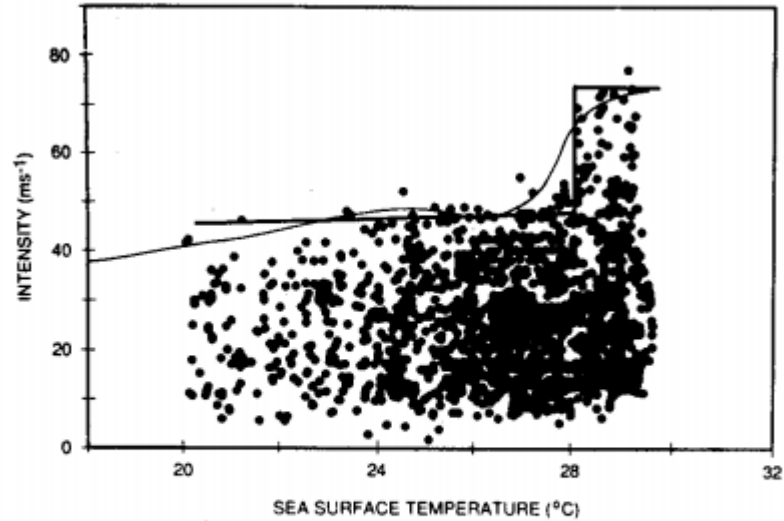


FIG. 2. Scatter diagram of climatological SST ($^{\circ}\text{C}$) against corrected tropical cyclone intensity (m s^{-1}) for the North Atlantic Ocean. Diagram adapted from Merrill (1987 Fig. 2), and covers the years 1974–1985. Hurricane intensities are corrected for observed storm motion.

Typical MPI equation (units knots), represented by the solid curved line

$$MPI = A + B \exp[-D(SST_0 - SST)]$$

where $A=66.5$ kts, $B=108.5$ kts, $D=0.1813^{\circ}\text{C}^{-1}$, $SST_0=30.0^{\circ}\text{C}$

Climate change on MPI is an active area of research

Controversial

See links on website for additional information