1. INTRODUCTION

Understanding fluctuations in tropical cyclone activity along United States shores and abroad becomes increasingly important as coastal managers and planners seek to save lives, mitigate damage, and plan for resilience in the face of changing storminess and sea-level rise. Tropical cyclone activity has long been of concern to coastal areas as they bring strong winds, heavy rains, and high seas. Given projections of a warming climate, current estimates suggest that not only will tropical cyclones increase in frequency, but also in intensity (maximum sustained winds and minimum central pressures). An understanding of what has happened historically is an important step in identifying potential future changes in tropical cyclone frequency and intensity.

The ability to detect such changes depends on a consistent and reliable global tropical cyclone dataset. Until recently no central repository for historical tropical cyclone data existed. To fill this need, the International Best Track Archive for Climate Stewardship (IBTrACS) dataset was developed to collect all known global historical tropical cyclone data into a single point-source for dissemination. With this dataset, a global examination of changes in tropical cyclone frequency and intensity can be performed. Caveats apply to any historical tropical cyclone analysis however, as the data contributed to the IBTrACS archive from various tropical cyclone warning centers is still replete with biases that may stem from operational changes, inhomogeneous monitoring programs, and time discontinuities. A detailed discussion of the difficulties in detecting trends using tropical cyclone data can be found in Landsea et al. 2006.

The following sections use the IBTrACS dataset to show the global spatial variability of tropical cyclone frequency and intensity. Analyses will show where the strongest storms typically occur, the regions with the highest number of tropical cyclones per decade, and the locations of highest average maximum wind speeds.

2. TROPICAL CYCLONE FREQUENCY

The IBTrACS dataset contains name, date, location and intensity information for storms in the world’s seven ocean basins affected by tropical cyclones: North Atlantic (NA), Eastern Pacific (EP), Western North Pacific (WP), Northern Indian Ocean (NI), Southern Indian Ocean (SI), South Pacific (SP) and South Atlantic (SA). The IBTrACS period of record by ocean basin is shown in Figure 1. Data for some basins are available from as early as 1848. After combining data from the available sources, the resulting IBTrACS dataset can be used to describe the climatology of global tropical cyclones, at least since global records began in 1945.

Analyzing the spatial variability of all storm tracks in IBTrACS for the years 1945 – 2007 shows the observed frequency of tropical cyclones at any location. Tropical cyclone data is typically recorded at 6-hour intervals. Figure 2 was constructed by taking each storm track in IBTrACS, connecting the locations of the 6-hour observation points into a storm path, then expanding the width of each storm path to 1º latitude (111 km). A grid superimposed over the ocean basins was then analyzed by decade to identify which grid points had a storm pass within 55 km. The resulting analysis represents the frequency of a tropical cyclone passing within 55 km of any point.
2. TROPICAL CYCLONE INTENSITY

Tropical cyclone intensity at a given 6-hour interval is typically measured using the minimum central pressure or the maximum sustained wind speed (MSW). The maximum MSW of all storms passing near a grid point on the globe is shown in Figure 3, whereas the average MSW is depicted in Figure 4. The highest average MSW is just east of the Asian continent. While the average MSW in the NA is not as concentrated as the WP, its areal extent of average MSW greater than 45 kt is much larger than any other basin. In the Southern Hemisphere, the winds tend to be strongest near the 20\textdegree latitude in both the SI and SP basins.