

Nine years after Katrina: Do we know better the relationship between tropical cyclone activity and global warming?

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In 2005, Hurricane Katrina hit the US. At the same time, two papers published respectively in Nature and Science implied that global warming apparently has resulted in an increase in the number of intense tropical cyclones. This conclusion has led to suggestions that there will be more Katrinas in the coming years, a notion that was hotly debated among tropical meteorologists at the time. In the subsequent years, many studies have been carried out, either to prove or disprove such a notion. Then, in recent years, some very intense tropical cyclones have also occurred: Nargis, Megi, Sandy, Haiyan. Such occurrences further sparked discussions of the possible impact of global warming and tropical cyclone activity. In this lecture, I will review studies on the relationship between global warming and tropical cyclone activity. The main focus is on tropical cyclones in the western North Pacific where the number of tropical cyclones is the highest among all ocean basins. Those in other basins will also be discussed when appropriate. It will be shown that in most ocean basins, the dominance of the dynamic factors associated with tropical cyclone activity makes any global warming impact on such activity undetectable, if any. However, it is still likely that under certain conditions, local thermodynamic conditions can overwhelm the dynamic factors and make individual tropical cyclones very intense. Whether such conditions are related to global warming will still need to be determined.