



***Helical tropical cyclogenesis: a modern look based on
cloud-resolving numerical analysis of self-organization of
moist convective atmospheric turbulence***

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Recent results of our collaborative Russian-American efforts on how a notion of helicity can be applied in the atmospheric research to tropical cyclone (TC) investigations will be presented. Briefly recalling the role of helical turbulence in the formation of large-scale structures in magnetohydrodynamics and general dynamics of non-conducting fluids, we make an accent on the existence of threshold for large-scale instabilities in all cases. To bring together the notion of helicity and TC formation, we emphasize one of the very first achievements obtained by near-cloud-resolving numerical simulation of tropical cyclogenesis. This is the discovery of vortical nature of atmospheric moist convection in the tropical zone – rotating cumulonimbus clouds, which were dubbed ‘Vortical Hot Towers (VHTs)’ – and their crucial role in TC formation (Hendricks et al., 2004; Montgomery et al. 2006). As it was noted by Molinari and Vollaro (2010), “VHTs are helical by definition because they contain coincident updrafts and vertical vorticity”.

For the first time in TC research, we highlight the inherently helical tropical cyclogenesis. This implies the role of a special topology of the newly forming mesoscale vortex and the contribution of motions of cloud scales – VHTs – to provide such topology. Our works of 2010-2016 examine helical self-organization of moist convective atmospheric turbulence during TC formation and offer a way to solution of one of the most intricate enigmas of meteorology on tropical cyclogenesis by diagnosing a time when cyclogenesis commences as well as allow to consider an idea on controlling the formation of hurricanes at the very early stage of their evolution.

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Thursday, 20 October 2016, 3:30 PM
Refreshments 3:15 PM
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