**1. Project Title:** Building a Pilot Seasonal Outlook for the Occurrence of Major US Tornado Outbreaks in Support of the Operations at NOAA’s Climate Prediction Center

**2. Investigators:** Sang-Ki Lee (Univ. of Miami and NOAA/AOML; [Sang-Ki.Lee@noaa.gov](mailto:Sang-Ki.Lee@noaa.gov)) and Scott Weaver (NOAA/NCEP/CPC; [Scott.Weaver@noaa.gov](mailto:Scott.Weaver@noaa.gov))

**3. Estimated Project Cost**: $70K for one year (October 1, 2015 - September 31, 2015)

**4. Summary of the Project:** The main goal of this proposal is to develop a pilot seasonal outlook for the US tornado outbreaks in March-April-May (MAM, the peak of the tornado season) with 1 to 3 months of lead-time (i.e., January, February, and March initializations). To achieve this goal, our work will be comprised of three tasks: (Task-1) evaluate the North American Multi Model Ensemble Phase 2 (NMME-2) prediction skill for springtime ENSO phase evolution and its relation to U.S. tornadic environments; (Task-2) construct proxy tornado indices using the NMME-2 analysis; (Task-3) analyze the NMME-2 prediction skill for the occurrence of U.S. tornado outbreaks.

**Task-1) Evaluate the NMME predication skill for springtime phase evolution**

The skill of NMME-2 system for predicting various ENSO indices including the Trans-Niño index will be assessed separately for the onset, decay, transition (El Niño to La Niña or La Niño to El Niño) and resurgent (El Niño to El Niño or La Niña to La Niña) phases targeting for April and May.

**Task-2) Establish tornadic conditions using the NMME analysis**

According to Brooks et al. [2003], significant severe thunderstorms are generated when CAPE ≥ 100 and 2–4 km above ground level lapse rate > 6.5 K km-1, while the so-called tornadic condition requires meeting two additional criteria:

2.86log(S6) + 1.79 log (CAPE) > 8.36, (1)

2.74S1 – 2.99×10-4 LCL – 3.06×10-4 ELV > 1.93, (2)

where S6 is the 0 – 6 km wind shear, S1 is the 0 – 1 km wind shear, LCL is the mean layer lifted condensation level (in m), and ELV is the station elevation (in m). We will test, and revise these criteria using the NMME-2 analysis (i.e., 0 ~ 24-hour forecast) and SWD to construct a proxy dataset of tornado-days, which can be obtained by counting the number of days in which the tornadic conditions are met, for the period of 1981-2010.

**Task-3) Analyze the NMME-2 prediction skill for the occurrence of U.S. tornado outbreaks**

We will analyze the skill of NMME-2 system for predicating the observed and proxy tornado-days in association with springtime ENSO phase evolution.

**5. Expected Outcomes and CIMAS Research Theme**

Successfully completing the three tasks will lead to a proto-type seasonal outlook for US tornado outbreaks based on the NMME-2 system. This proposed work will be conducted under the auspices of the Cooperative Institute of Marine and Atmospheric Science program at the University of Miami’s Rosenstiel School of Marine and Atmospheric Science, and addresses CIMAS Theme: (Climate Research and Impacts).