Title: Observations and theoretical calculations of global ozone depletion via the cosmic-ray driven electron-induced reaction (CRE) mechanism

Abstract:
The cosmic-ray (CR)-driven electron-induced-reaction (CRE) mechanism of atmospheric ozone depletion was proposed about two decades ago. The subsequent predictions of the existence of 11-year cyclic variations in both polar $O_3$ loss and associated stratospheric cooling and of the earlier recovery of the Antarctic ozone layer than the ozone layer at mid-latitudes and the tropics are now well proven by observed data over the past two decades. Particularly the observed vertical profiles of Antarctic $O_3$ trends provide the fingerprints of the CRE mechanism. Moreover, using the TOST ozonesonde dataset complemented with satellite data, I discovered the largest tropical ozone hole in 2022, consistent the first report of the largest percentage $O_3$ loss in the tropical lower stratosphere below 20 km by satellite data by Randel et al. In this talk, I will discuss the progress and present theoretical calculations by the CRE mechanism of ozone depletion in both the Antarctic ozone hole and the tropical ozone hole and at mid-latitudes as well. Additionally, I may briefly present main results from my recent paper on the dominant warming mechanism of CFCs for global warming observed since the mid-1970s.