

## 4.251 Exploring the Atmospheric Composition in the Changing Climate Scenario of Pakistan .

Presenting Author:

**Muhammad Fahim Khokhar**, Institute of Environmental Sciences and Engineering- NUST Pakistan, [fahim.khokhar@iese.nust.edu.pk](mailto:fahim.khokhar@iese.nust.edu.pk)

Co-Authors:

**Naila Zeb**, Institute of Environmental Sciences and Engineering- NUST Pakistan

**Asad Ullah Shoaib**, , Institute of Environmental Sciences and Engineering - NUST Pakistan

**Ahsen Ali**, Institute of Environmental Sciences and Engineering - NUST Pakistan

**Ali Hassen**, Institute of Environmental Sciences and Engineering - NUST Pakistan

Abstract:

Although, Pakistan is not contributing much to GHG emissions (ranked 135) as compared to other industrialized nations, however, it is listed among nations that are most vulnerable to the global warming and extreme weather events. The impacts of climate change/global warming can be copped by having better understating of the mechanisms, identifying the sector of most vulnerability, and controlling the emissions of GHG and short-lived climate pollutants (SLCPs)contributing directly and/or indirectly to climate change.

Pakistan is facing challenges due to observed changes in temperature, precipitation and other climatic abnormalities such as droughts and torrential rains. In this work, we assess and identify the extent of temperature and precipitation changes over Pakistan, by dividing the whole region into five climatic zones, which range from very cold to hot and dry climates. An absolute increase of 0.07 °C is observed in the mean temperature over Pakistan during the time period of 1980-2016. An interesting feature of both spatial and temporal shift in monsoon pattern is identified. This study further emphasises on the formation of the first database of tropospheric ozone, CO, HCHO, NO<sub>2</sub> and SO<sub>2</sub> distribution over Pakistan during the time period of 2004 to 2016.

Efforts are made to track the spatial and temporal changes in trace gas concentrations over Pakistan in the changing climate scenario. Seasonal cycles of all listed trace gases are identified over four provinces of Pakistan. A further focus is made on the comparison of satellite-born and ground-based measurements. Although the validation of tropospheric trace gas products from satellite observations is a challenging task for several reasons e.g. vertical sensitivity of satellite instruments, the spatial extent of the satellite ground pixel, cloud coverage etc. The efforts are made to validate satellite observations by using mini MAX-DOAS observations at fixed locations and at a moving platform.