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Meteorology and Space Weather as Coupled Frameworks

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The connection between Earth's meteorology and meteorology of space (space weather) has been investigated since many years, but a unified framework has still to be conceived and proven.

Physical commonalities exist, but the coupling is highly nonlinear and the two physical systems have the character of complex ones: this nature is probably the reason why it is so difficult to identify, e.g., the solar signal(s) in meteorological observations.

For instance, the Sun is the primary source of energy input to the atmosphere via its shorter wavelength radiation and precise measurements from space have pointed out that the spectral irradiance variations from minimum to the maximum solar activity are significant at these wavelengths.
Anyway, such variations are smoothed out in climatological tropospheric time series and do not appear clearly even by nonlinear dynamics analysis.

In this work, we briefly introduce both frameworks at the maximum level of abstraction by stressing their commonalities and diversities in the attempt to summarise the level of knowledge achieved to date and to emphasise prospective work.