Submitted Abstract

ID IMC22-FSAbstr- 258

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Country	Italy
Region	Western Europe
Title	Synoptic Control Over Winter Snowfall Variability Observed In Montevergine Observatory (Southern Italy), 1884-2015.
Keywords	Snowfall Variability, Long-Term Changes, Large-Scale Atmospheric Circulation, Teleconnection Indices
Type	List Of Focus Session
Focus Session ID	09

Abstract

This work presents a new, very long snowfall time series collected in a remote site of Italian Apennine mountains (Montevergine Observatory, 1280 m a.s.l.). After a careful check, based on quality control tests and homogenization procedures, the available data (i.e. daily height of new snow) have been aggregated over winter season (December-January-February) to study the long-term variability in the period 1884-2020. The main evidences emerged from this analysis lie in (i) the strong interannual variability of winter snowfall amounts, in (ii) the absence of a relevant trend from late 19th century to mid-1970s, in (iii) the strong reduction of the snowfall amount and frequency of occurrence from mid-1970s to the end of 1990s (-45 and -17% compared to the average recorded in 1884-1975 period, respectively), and in (iv) the increase of average snowfall amount and frequency of occurrence in the last 20 years.

Moreover, this study shed light on the relationship between the snowfall variability observed in Montevergine and the large-scale atmospheric circulation. Six different synoptic types, describing the meteorological scenarios triggering the snow events in the study area, have been identified by means of a cluster analysis, using two essential atmospheric variables, the 500-hPa geopotential height and the sea level pressure (both retrieved from the third version of Twentieth Century Reanalysis dataset). Such patterns trace out scenarios characterized by the presence of a blocking high-pressure anomaly over Scandinavia or North Atlantic and by a cold air outbreak, involving both maritime and continental cold air masses. A further analysis demonstrates that the identified synoptic types are strongly related with different teleconnection patterns, i.e. the Arctic Oscillation (AO), the Eastern Atlantic Western Russia (EAWR), the Eastern Mediterranean Pattern (EMP), the North Atlantic Oscillation (NAO) and the Scandinavia pattern (SCAND), that govern the European winter atmospheric variability. The relevant decline in snowfall frequency and amounts between 1970s and 1990s can be mainly ascribed to the strong positive trend of AO and NAO indices, which determined, in turn, a decrease in the incidence of patterns associated to the advection, in central Mediterranean area, of moist and cold arctic maritime air masses. The recent increase in average snowfall amounts can be explained by the reverse trend of AO index and by the prevalence of neutral or negative EAWR pattern.