Nature Predictability of Flood-Producing Cyclones Occurring within Mediterranean Basin during Mid-Autumn to Early-Winter

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Severe flood-producing storms within the Mediterranean basin perpetually arise toward year's end from baroclinic disturbances developing on westerly longwaves, with the incipient storm circulations appearing well west of the eventual flood areas. Various of these storms produce catastrophic flooding and landslides, particularly in locations of steep terrain or where there are preferential meteorological mechanisms interacting with specific complex terrain features. Regardless of the storm genesis locations, as the storms begin their flow interactions with the orography of southern Europe, the Balkans, and at times northern Africa (especially those areas with very steep terrain characteristics), much of their moisture is drawn from the warm Mediterranean waters with important elements of their thermodynamic structure derived from airmass properties originating in north Africa and the Mediterranean basin itself. In fact, because of strong thermodynamic contrasts between the baroclinic zone producing the incipient disturbances and high potential temperature air masses from the south advecting into and wrapping around storm centers, a Mediterranean storm whose origins are a cold core baroclinic disturbance, can sometimes become a quasi-warm core hybrid in term of energetics, a process somewhat akin to the development of a polar low. There are a number of other fascinating aspects to these storms that have eluded detection until fairly recently, aspects that deserve careful scientific attention because they are related to storm predictability – in a positive sense.

A better understanding of how these storms develop and are maintained is made possible by improved observational and numerical modeling analyses. Improved observational analyses are achieved through active-passive microwave remote sensing from space, especially by concentrating on cloud microphysical processes associated with precipitation, processes which partly reveal important underlying meteorological mechanisims leading to storm intensification. Improved numerical modeling analyses are achieved through the use of a nonhydrostatic mesoscale model run at cloud-resolving model (CRM) resolution, in which the external boundary conditions are derived from synonymous operational global analyses. With these tools, dynamical, ther-

modynamical, and hydrometeorological properties of autumnal Mediterranean storms are investigated by a combination of *in situ* meteorological data analyses, spaceborne microwave remote sensing, and numerical simulations. The ensuing analyses encompass a variety of late-season severe-damaging storms that have created suffering within the Mediterranean basin. Results from the analyses are used to better understand the stationary and changeable factors which ultimately control the predictability of these storms – particularly for events which portend floods, landslides, and human adversity.