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Mesoscale Convective Complex over Central Mediterranean on 20^{th} September 2014

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The warm period of the year 2014 in Croatia was characterized by high impact weather situations. Thunderstorms developed more often than usual bringing extreme amounts of precipitation, frequent flash floods and very strong lightning activity. On several synoptic stations the daily maximum amount of rainfall was exceeded more than once. One of the extreme weather events occurred on 20^{th} September 2014 when Mesoscale Convective Complex (MCC) formed over the central Mediterranean. Although, large and long-lived MCC's are not uncommon, in studied region they appear quite rare.

The studied MCC developed during the night hours in the northern Italy and crossed over the Adriatic Sea, Croatia and Bosnia and Herzegovina before the noon. It formed in the region ahead of an upper level trough which was characterized by warm air advection, southwesterly jet and strong moisture advection. Carried with upper level winds, MCC was following the shape of upper level ridge. In the afternoon it had turned southeast and started to weaken, so most of the severe weather occurred over northern Italy and Adriatic Sea.

One curiosity about this MCC is that two airline flights, flying through peripheral parts of MCC at FL370 ($\sim$11533m) and FL400 ($\sim$12192m), reported unusually high horizontal temperature gradients (27˚C and 30˚C over distance of 74km).

Detailed analysis of MCC development and structure were studied using the MSG SEVIRI infrared 10.8 μm satellite data to examine the cloud top height and temperature, as well as high resolution visible (HRV) channel data, during the day-time, which provide the information about 3D structure of the storm tops. The satellite analyses showed a convective complex which covers an area of $\sim$ 196 000 km^2 and had extraordinarily high cloud tops with minimum infrared 10.8 μm brightness temperature of approximately -76 ˚C. Large CAPE and very high values of low-level shear derived from the soundings data in studied region showed favorable conditions for strong organized convection. Lightning properties, such as number, type, polarity and electric current of lightning strokes during the MCC lifetime were analyzed using lightning discharges registered by the International Lightning Detection Network in Europe (LINET).

The numerical weather prediction (NWP) model ALADIN was used in order to analyze meteorological parameters before, during and after the MCC occurrence. Numerical forecast was compared with observations and measurements to verify the possibilities of ALADIN model to resolve and predict storm complex at the space and time scales where it occurred.