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Interactive comment on "Meteorological analysis of flash floods in Artvin (NE Turkey) on August 24, 2015" *by* Hakki Baltaci

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I thank the reviewer for his/her constructive comments. According to your reviews, I rearranged the manuscript and answered your questions as follows.

Reviewer quote 1: While I understood the second type of flood, it is not clear the first type. Please, clarify it (P2, L16-19)

Answer 1: To explain the first type of flood, I added a sentence "In the first type, river basins respond rapidly to intense rainfall because of steep slopes, impermeable surfaces, saturated soils, or because of anthropogenic forcing to the natural drainage" to the second paragraph of the introduction section.

Reviewer quote 2: I think the comparison is between Figure 4a and 9: can you show

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them with the same colour legend in the investigated area? The differences between models and observations would be better appreciated (P6,L3).

Answer 2: Thanks for your comments. In accordance with your explanations, I rearranged Fig. 4a colour legend similar that of Fig. 9.

Reviewer quote 3: When you say: "Optimum spatial coverage. . ." It's difficult to spot with different maps and colours. (P12-L4).

Answer 3: As you mentioned above, it can be difficult to distinguish the optimum spatial coverage. However, when we focused on the spatial distribution of the measured precipitation (Fig. 4a) data, we can see the highest daily precipitation totals are only shown in the seaside stations of Artvin and the other two NWP model forecasts do not well coincide with observation values.

Reviewer quote 4: Please, add some references about the NWP models, in particular some physics features about the WRF (used version) and the ALARO models (P5, Section 2.3)

Answer 4: To give more details of the physics of the NMM-WRF, I added some sentences at the end of the first paragraph of the Section 2.3 as follows:

"The mesoscale NWP systemÂň of Non-hydrostatic Mesoscale Model (NMM) core of the Weather Research and Forecasting (WRF) is developed by the National Oceanic and Atmospheric Administration (NOAA)/National Centers for Environment Prediction (NCEP), NMM-WRF is a fully compressible, non-hydrostatic mesoscale model with a hydrostatic option (Janjic, 2003). The model uses a terrain-following hybrid sigma-pressure vertical coordinate. The grid staggering is the Arakawa E-grid. The model uses a forward-backward scheme for horizontally-propagating fast waves, an implicit scheme for vertically-propagating sound waves, the Adams-Bashforth scheme for horizontal advection, and the Crank-Nicholson scheme for vertical advection. The dynamics conserve a number of first and second order quantities including energy and

enstrophy."

For the Alaro model, a brief explanation together with its references was added to the Section 2.3 as follows:

"For the regional weather forecasts, the Alaro meteorological model has been designed to be run at convection-permitting resolutions. The key concept is in the precipitation and cloud scheme called Modular Multiscale Microphysics and Transport (3MT) developed by Gerard and Geleyn (2005), Gerard (2007), and Gerard et al. 2009. In the usage of the Alaro by TSMS, whereas the outer domain has grid spacing of 10 km, the inner domain has almost 5 km of grid spacing as well as 60 vertical levels."

Reviewer quote 5: What do you mean with "moderate climates"? (P6, L13)

Answer 5: "Moderate climates" were changed to "more dry climates" term in the text.

Reviewer quote 6: you wrote:"the highest amount of precipitation is observed during wet and dry seasons". It confuses me: how could it be in dry season, if we are talking of the highest amount?

Answer 6: "... In terms of precipitation values,..." sentence was rephrased and instead, "When compared with the other regions, highest winter and summer precipitation totals are observed in this part of Turkey due to the interactions of synoptic weather patterns and orographic lifting." term was added.

Technical corrections:

P1, L22: I suggest: "...flood damages in the Artvin area." It was corrected.

P2, L5-10: I suggest: "For example, just one flash flood in 2002..." It was corrected.

P2, L9: I suggest: "For example, just a single flash flood caused €.2 billion Euro damages in the Gard region of France in 2002 (Huet et al., 2003), €00 million Euro damages in the Pinios (Greece) flash flood during 1994 (Gaume et al., 2008), €5 million Euro economic losses in the Magorala (Spain) flash flood in 2000 (Llasat et

al., 2001), and €.6 million Euro in the 2007 Mastroguglielmo (Italy) flash flood event (Aronica et al., 2008). It was corrected.

P3, L9: Remove “a” before “slow-moving” It was corrected.

P3, L13: I suggest “triggered landslides” It was corrected.

P3, L16: Remove “the” before “rainfall” It was corrected.

P4, L7: Remove the apostrophe after “dollars” It was corrected.

P5, L2: I suggest “meteorological stations” It was corrected.

P5, L4: I suggest: “and to” instead of “as well as” It was corrected.

P5, L9: I suggest “as the previous day atmospheric. . .” It was corrected.

P5, L19: I suggest: “In the Alaro meteorological model. . .” It was corrected.

P6, L16: I suggest: “due to. . .” instead of “because of. . .” It was corrected.

P7, L4: I suggest to replace “instead of” with “while” The sentence was rearranged.

P7, L9-10: I suggest to remove this sentence: “Nevertheless. . .” It was corrected.

P7, L16: Replace “those” with “the” It was corrected.

P8, L2: Replace: to with “from” It was corrected.

P8, L3: Do you mean “dropping from 4 to 2”? It was corrected.

P8, L7: I suggest: “The maximum daily precipitation value was. . .” It was corrected.

P9, L6: I suggest: “eastern” instead of “east to” It was corrected.

P9, L9: “and through the axis”: this sentence is not clear, please clarify it. The sentence was rearranged.

P9, L16: add “the before “moving”. Remove semicolon after “thus” It was corrected.

P10, L5: “(not shown)”: do you mean not shown in the text? Temp diagram was not shown

P10, L19: I suggest “the storm intensity” It was corrected.

P12, L1: I suggest: to the Alaro model” It was corrected.

P12, L10: I suggest “issue” instead of “give” It was corrected.

P12, L20: I suggest “6 to 7 hours” It was corrected.

P13, L12: I suggest to move this sentence at the beginning of the conclusion section. Done

P20, L6: I suggest: “in °C)” It was corrected.

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