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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Seeking for key meteorological parameters to better understand Hector" *by* S. Gentile and R. Ferretti

Anonymous Referee #1

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The paper presents an analysis of twelve simulations of Hector events and investigates their sensitivity to environmental parameters. It is found that the wind direction is crucial for the development of Hector over the ellipsoidal Tiwi Islands. The low level moisture does not allow for differentiating types A and B.

Specific comments Page 3622, line 12, "The strength of the convection is largely contributing to the vertical distribution of hydrometeors." The strength of the convection can be defined according to the vertical distribution of hydrometeors (as done page 3640, line 13 when writing "total condensate"). In that case, there is a tautology here. It would be helpful to give a clear definition of the strength of the convection.

A proper definition of "convective cell" is lacking. Page 3623, line 17, a cell corresponds

to the full thunderstorm Hector while page 3631, line 12, cells refer to smaller objects.

Page 3624, line 11, "A 1 km resolution is fine enough to simulate faithfully this storm". With two different models running with 1 km grid spacing, Chemel et al. (2009) get very different results in term of injected water vapor into the stratosphere. "Faithfully" is too vague here.

It is implicitly assumed that the different simulations mimic the reality. Recent TWP-ICE intercomparison studies by Varble et al. (JGR 2011, 2014) and Fridlind et al. (JGR 2012) have shown that ten 3D cloud-resolving models produced too intense updrafts. This should be the case for the MM5 simulations used here. A discussion on the uncertainties associated with the simulations and consequently on the veracity of the results would benefit to the paper.

Page 3628, line 10. At which level is the water vapor mixing ratio taken?

Page 3628, line 15. The use of meteorological analysis 6 h later in case of double cell is not sufficiently justified. This implies that the second cell appears 6 hours after the first one (which is certainly not true). This also implies that the net effect of the first cell has been taken into account in the ECMWF analysis (which might be not the case because of the coarse resolution of the ECMW model). At least, the time delay between two successive cells should be given. Also the uncertainties associated with the analysis should be discussed.

Page 3629, line 19 "... the heated and moistened surface of Tiwi Islands". How do the initial surface conditions and surface fluxes differ in the simulations? These variables should be documented as they are essential for the deep convection.

Page 3630, line 9, CAPE is the vertical integral of positive buoyancy.

Page 3630, line 22, it should be mixing ratio (instead of relative humidity)

Page 3633, line 8. How is defined the volume encapsulating Hector?

Page 3638, line 15. It is not clear why a distance between the "real" and "ideal" points is a metrics for the contribution to the Hector development.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 3621, 2015.