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Initiation of deep moist convection at WV-boundaries - a comparison between MSG WV - channels 5 and 6

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Under the synoptic condition of “fair weather” (upper level pressure ridge, equivalent thickness ridge), shallow convection (in the sense of “not deep”, a capping inversion is no necessary condition here) appears especially over mountainous areas if a sufficiently moist surface layer and initial instability is existent. As observations with the METEOSAT 7 WV – channel showed, Deep Moist Convection (DMC) developing from this shallow convection preferably appears first at the transition zones between areas with dark/dry and bright/humid pixels, the so-called WV – Boundaries.

Different processes seem to favor the onset of deep moist convection at boundaries in the WV image. The surface below the dry regions may receive stronger heating than below the humid region. Therefore DMC might be released earlier and dry - entrainment becomes weaker at the boundary towards the moist zone. Although potential instability is higher within the dark area of the WV image, the missing upper level humidity supply mostly restricts growing of deep convection. It seems that the combination of all single effects, being responsible for convection, leads to favorable conditions for the onset of DMC in the transition area of the WV – Boundary (Krennert and Zwatz – Meise, 2003).

Meanwhile, the new MSG water vapour channels offer better spatial and temporal resolution. An investigation of WV channels 5 and 6 is currently ongoing in order to take a closer look at the differential vertical and horizontal moisture distribution. The MSG WV channels 5 and 6 roughly display the humidity content in two different layers. Channel 5 has a maximum absorption at a wavelength around 6.2 μm, with the

maximum signal being received from around 350 hPa. The WV channel 6 has maximum absorption at 7.3 μm, with a maximum signal from around 500 hPa. Therefore a differentiation between the moisture content in the lower and higher middle troposphere is possible. The combination of MSG channels qualitatively shows the different humidity content at two levels. Thus, an information about the horizontal and vertical distribution of the humidity gradient - and therefore a horizontal distribution of the potential instability - can be derived more precisely and will be presented.

Additionally, the dynamical behaviour at two different layers can also be shown by atmospheric motion vectors, calculated from both WV channels.

Furthermore different MSG channel combinations and RGB's provide a better possibility to visualize the life cycle and growth of the single convective cells.

References:

KRENNERT, T., Zwatz-Meise, V., 2003: Initiation of convective cells in relation to water vapour boundaries in satellite images, Atmos. Res., Vol 67, p 353-366