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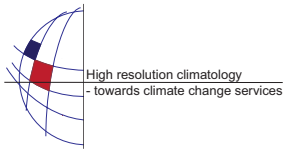

A mechanism for orographically-generated PV banners to generate cloud and precipitation bands: a case study

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A series of quasi-stationary precipitation bands sometimes sometimes emerge in post-frontal flow from a series of narrow valleys into the downwind Snake River Plain, a ∼100 km wide plain located in the western USA. These bands occur well behind the region of baroclinicity and frontogenetic circulation, and they are generally not captured by current operational NWP models. The bands are aligned with the flow over the upstream mountain. This mountain, rather than being a solid barrier, is intersected by wind-parallel valleys about 20 km apart, from which the precipitation bands appear to emerge. High-resolution numerical simulations for a case in winter indicate that the along-wind valley-ridge sequence creates as series of alternating cyclonic and anticyclonic potential vorticity banners that are advected downstream over the plain. Two cases will be presented, one (on 24 Dec 2007) in which the subsident flow was too dry to create any precipitation, and another (on 26 Nov 2005) with precipitation bands. The PV banners are present in both cases, but in the moist case, slantwise ascent appears to occur, roughly along the moist isentropes, especially in regions with negative PV. The regions of potential symmetric instability were sufficiently deep to produce clouds, precipitation, and on occasion upright convection. For the particular topography around the Snake River Plain, ascent also results from convergence in the lee of the upstream mountain, which partially blocks the flow, and from another mountain range downwind of the Snake River Plain, which is high enough to support a barrier jet