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On the pressure oscillation and severe heavy rain

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ON THE PRESSURE OSCILLATION AND SEVERE HEAVY RAIN

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diminished rapidly. These oscillations were usually accompanied with stronger precipitations, so the probability of intense heavy rain in narrow valley is often higher than that of plain area and broader valley with width>100km. (3) In the small basin: basins with diameter around 40-80 km in humid area were of high heavy rain frequency also. When cold air flowed onto a small basin in the west part of Hunan, in the beginning, air pressure at three stations inside the basin increased abruptly. But 4-5 hrs later, a distinct decrease occurred, and thereafter, drastically increased again, and with an amplitude up to 2 hPa, and with a horizontal propagation about 50-200 km/hr. After cold air moved outside of the basin, the oscillation decreased quickly, therefore, the corresponding heavy rain occurred mainly in and/or near the basin. The precipitation usually occurred behind of the beginning of the oscillation by 1 hr or nearly at the same time. We considered that the presence of pressure oscillation is partly related with the arriving of cold air, and on the other hand it is also related to the warm air filling in the basin with lower density anterior the cold air invasion. Thus when the cold air with higher density invaded, disturbance will be occurred between these two airs with different densities. (4) Pressure oscillation induced by sequential temperature lapsrate between the mountain foot and top stations (ęÃ), we found that when the nonlinear temporal variation ofęÃtook place, then the pressure oscillation could be occurred 2-3 hrs later. Sometimes heavy rain was accompanied. (5) When meso-scale non-linear variation of horizontal temperature gradient occurred, pressure oscillation appeared evidently. In a case studied, no significant pressure oscillation showed at those places where horizontal surface temperature distribution were even in the northern and the southern regions of the Experiment Base. But extremely uneven horizontal temperature distribution was in the central Hunan Base, there were 6 meso-cold and warm centres arranged alternatively within an area of 2ąãąÁ3ąã(latitudeąÁlongitude), in which 36ąæ at the maximum centre and 27ąæ at the minimum centre. Such that pressure oscillation appeared obviously, especially at the centre of the greatest temperature gradients(1.0ąæ/10km). Nevertheless,this extremely uneven temperature gradient was largely owing to the precipitation. So precipitations occurred episodically. In summary, under various synoptic circulations and variant underlaying boundary conditions, pressure oscillations associated with precipitation are different in properties which may be related to the different origin of formation.But meso-pressure oscillations were mostly caused by the gravitational waves activated by the topographic relief and the non-linear temperature variations. Although the pressure field is adjusted toward the wind field in meso-systems, but owing to: 1) the time of adjustment is very short, usually about 1/2 hr; 2) ageostrophic and supergeostrophic features of wind are very strong in the heavy rain area and/or the vicinity region, which is disadvantage in the delimitation of meso-systems; 3) sequential variation in self-pressure records are much delicate, even can be delimited up to 0.2-0.5 hPa isobars.that is benefit to outline meso-systems, since analyses on the wind field are much less delicate and objective.Therefore, we think,quickly collect and enlarge the sequential pressure records from relevant stations might be valuable for the severe heavy rain analysis and forecast.