

B01-P10

THE EXTREME EUROPEAN COLD SPELL IN 2011/12 WINTER. PART II: THREE-DIMENSIONAL STRUCTURE OF ANOMALIES AND IMPORTANCE OF ENERGY CONVERSION FOR THEIR MAINTENANCE

Hisashi Nakamura (*University of Tokyo, Japan*)

Lin Wang (*University of Tokyo, Chinese Academy of Sciences, Japan*)

Kazuaki Nishii (*University of Tokyo, Japan*)

hisashi@atmos.rcast.u-tokyo.ac.jp

The extreme cold spell over Europe and western Russia observed in the 2011/12 winter is studied further on the basis of a global atmospheric reanalysis data (JRA25), with a particular attention to three-dimensional structure of quasi-stationary anomalies observed from mid-January to mid-February. In the initiation and growing stages of the cold spell in mid- and late January, respectively, the development of the anticyclonic anomaly observed over western Russia and/or to the north of Europe was contributed to by quasi-stationary Rossby wavetrains and feedback forcing from transient eddies, as discussed in detail in the companion talk by Lin Wang. Interestingly, the primary anticyclonic anomaly tended to exhibit a westward phase tilt with height in its western portion and a poleward tilt in its northern portion during the initiation and growing stages, and so was the case also in the mature phase of the cold spell (early February). These phase tilts became particularly distinct as the anomaly strengthened, but the particular baroclinic structure of the anomaly was lost in its decaying stage. The phase tilts were equivalent to poleward and eastward heat transport by the anomaly under the climatological equatorward and eastward temperature gradient. The down-gradient heat transport was indicative of the conversion of available potential energy (APE) into the anticyclonic anomaly. The APE conversion tended to increase its importance for the amplification or maintenance of the anticyclonic anomaly, as it expanded westward toward the East Greenland Sea in the growing stage, and it seemed to become the primary mechanism for the maintenance in the mature stage. It is also discussed how the low-level anomalous winds and associated heat transport could contribute to the formation of the cold anomalies over Europe.