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Changes of snow cover parameters in the north of Eurasia and their relation with recent global warming and macro-scale atmospheric circulation

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Variations of snow cover onset/destruction datesbased on daily snow depth data collected at first-order meteorological stations in 1950-2012 compiled at the Russia Institute of Hydrometeorological Information were analyzed in order to reveal their spatial/temporal peculiarities and relation with recent global warming and macro-scale atmospheric circulation variation in the terms of Northern Hemisphere Teleconnection patterns. The most essential long-term changes of snow cover onset dates (up to 10 days) caused by last autumn temperature trend since 1990 are revealed for relatively small regions in the center of European Russia territory and south-west of Siberia. For the most portions of the territory variations of snow cover onset data may be explained by the circulation indices Scand, EA-WR, NAO,WP, with the leading role of the Scand and EA-WR. Changes of snow cover extent over the Russia territory for the 2nd decade of October demonstrate significant difference in variability between western and eastern parts. Eastern part of territory essentially differs by low long-term and year-to-year variation in the contrast to the western part, characterized by high variance including long-term tendencies: increase in 1950-1970's and decrease in 1970-1980's and during last 6 years. Response of the snow cover destruction dates on recent global warming is evidently demonstrated by their correlation with spatially averaged surface air temperature in March. Statistically significant negative correlation is observed in south and south-west of the European Russia territory, the southern half of Western Siberia, Baikal region and south-east of Russia. More than 10 day shiftsare revealed in the west and southwest of Russian Plane and Baikal region. For the south and southwest of the Russian plain, shifts of the snow cover destruction dates in 1998-2007 (compared to 1951-1980) reach 15-20 days, while in the northeastern European Russia, on the Kola Peninsula, in the north of Western Siberia and south-east of Russia there were observed inverse changes for the later dates about5-10 days. The most notable changes (more than 20 days) observed in the southwest and west of the Russian plain are associated with anomalies of the North Atlantic Oscillation (NAO). The positive trend of the NAO (in late winter - early spring) since the early 1970's appear to be the major circulation factor of the revealed changes of the snow cover destruction dates in the south and southwest of the Russian plain during the last decades. Shifts for the later snow cover destruction, observed over the last decade in the north of West Siberia and north-east of the Russian plain, may be explained by the positive anomalies of the circulation indices Scand and EA-WR in the second half of the 1990's and early 2000's.

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