

Changes in action of atmospheric blockings

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Changes in atmospheric blockings action S for the Northern Hemisphere during 1968-2007 were analyzed (Mokhov, 1999; Mokhov, 2006a,b).

Action S of individual climate structure, in particular for atmospheric blocking, is defined as $\int E(t)dt$, where integration on time t is performed from 0 to τ , τ – vortex life time, E – blocking energy. Kinetic energy of extratropical (geostrophical) vortex can be expressed via $(\Delta P)^2$, where ΔP is a pressure difference between centre and periphery of the vortex (Akperov et al., 2007; Golitsyn et al., 2007). Integral action S_{Σ} for ensemble of vortices is defined by the sum of values of action for individual vortices.

Action S of individual blockings was estimated as proportional to $I^2\tau$ with mean intensity I (I related with ΔP) and duration τ of blocking determined according to Wiedenmann et al. (2002).

Figure 1 shows changes of atmospheric blockings action S (normalized on the mean value for 1971-2000) in the Northern Hemisphere during 1968-2007 for annual means, winter and summer. General increase of S during last decades is accompanying by significant interannual variations especially during last years. Tendency of the increase during last decades (at least since 1980s with a general warming) was obtained in the Northern Hemisphere for all seasons but with different level of significance. The most significant trend of S was estimated for spring season.

It should be noted that the most significant mean contribution to the annual blockings action is associated with winter season. The least values of S were obtained for summer season. Extreme value of S in summer was noted in 2003. This summer was extremely warm in Europe (with drought and fire conditions related with blocking conditions).

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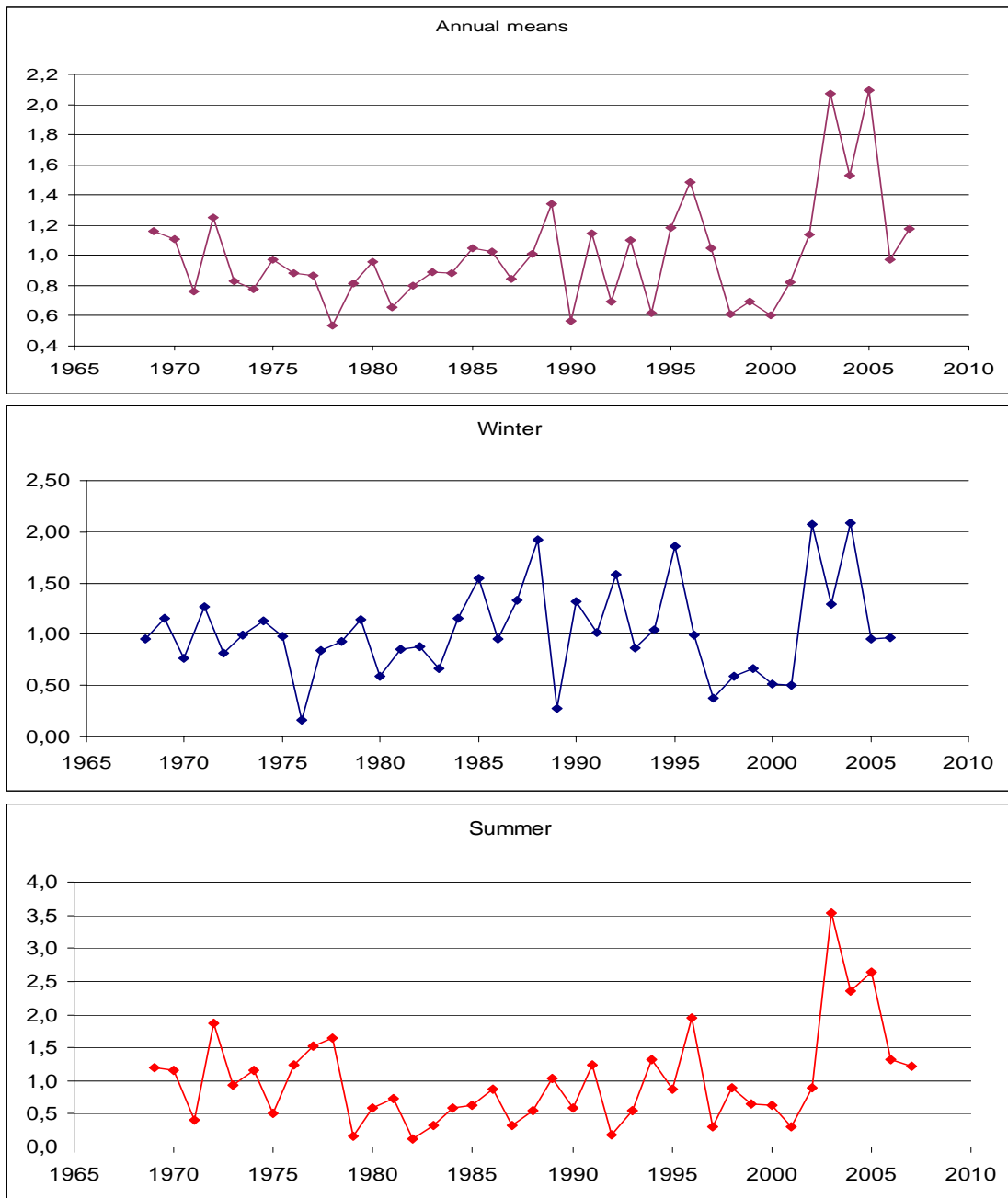


Figure 1. Changes of atmospheric blockings action (normalized on the mean value for 1971-2000) in the Northern Hemisphere during 1968-2007 for annual means (a), winter (b) and summer (c).