

Active Boreal Forest Fires and Warm Air Masses

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Weather conditions for concurrent widespread fires in East Siberia and Alaska were examined by various weather maps and temperature charts. Figure 1 shows four study regions in four rectangles with solid colored line. Three regions in East Siberia and one in Alaska were selected for a comparison of fire activities. For each rectangle, we collected MODIS (Moderate Resolution Imaging Spectroradiometer) hotspot (HS) data and analyzed them to grasp fire history and active fire-period during 2002 to 2017. We named four target regions: 1. Southern Sakha (SS), 2. Northern Krasnoyarsk (NK), 3. Southern Khabarovsk (SK) and 4. Interior Alaska (IA). More than 12 very active fire-periods were identified from satellite HS data by considering number of daily HSs (>300) and their continuity.

Figure 1 shows the temperature chart at mid level (850 hPa) on August 19, 2002, peak HS day during the top active fire-period in SS. Many red HS dots (fires) under warm air mass (cTe: continental temperate) with around 284 K (temperature of nearest anvil-shaped contour line) are suggesting active fire occurrence. This warm air mass (cTe) moved from the north end of a subtropical high-pressure zone at around 40–50° N. The northward advection of cTe began on August 12, seven days before the HS peak day. Large meandering westerlies over Siberia forced northward advection of cTe from the arid continental interior (subtropical high-pressure belt at around 30° N, 40–100° E) as shown in Figure 1. Large meandering westerlies due to stagnating low- and high-pressure systems were recognized from the averaged weather map at upper level (500 hPa). Stagnating low- and high-pressure systems during the top active fire-period located at around 66° N, 60° E and around 66° N, 126° E. The downward flow of stagnating high-pressure systems over SS supplied warm and dry air (fire favorable conditions) to the ground surface (fire area). The other remaining active fire-periods occurred under similar weather conditions.

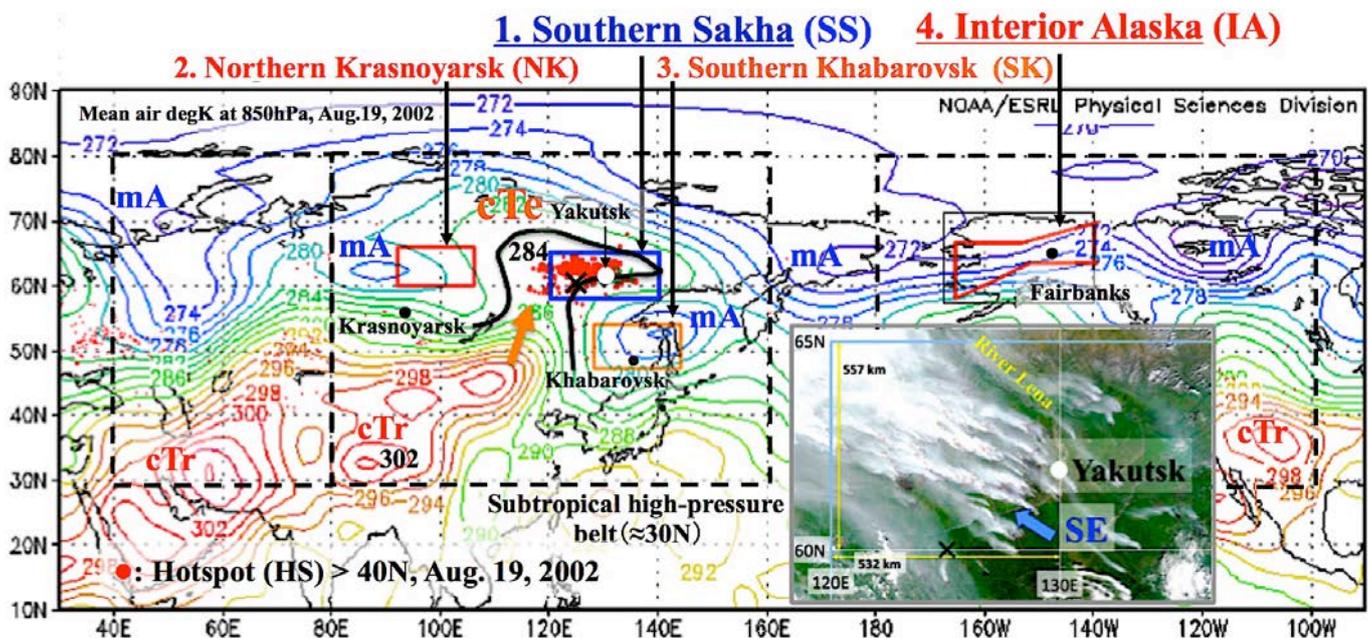


Figure 1. Map of four study regions in boreal regions on the temperature chart (850 hPa) on 19 August 2002. Inserted satellite image was captured on August 19, 2002 during the top fire-period in SS. Image shows the most active concurrent widespread forest fires in SS under southeasterly wind.

References

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