Geophysical Research Abstracts
Vol. 15, EGU2013-8588, 2013
EGU General Assembly 2013

A possible cause of the AO polarity reversal from winter to summer in 2010 and its relation to hemispheric extreme hot summer

Yoshihiro Tachibana (1,2), Yuriko Otomi (1), and Tetsu Nakamura ()

(1) Mie University, Tsu, Japan (tachi@bio.mie-u.ac.jp), (2) JAMSTEC, Japan, (3) Hokkaido University, Sapporo, Japan

In 2010, the Northern Hemisphere, in particular Russia and Japan, experienced an abnormally hot summer characterized by record-breaking warm temperatures and associated with a strongly positive Arctic Oscillation (AO), that is, low pressure in the Arctic and high pressure in the midlatitudes. In contrast, the AO index the previous winter and spring (2009/2010) was record-breaking negative. The AO polarity reversal that began in summer 2010 can explain the abnormally hot summer. The winter sea surface temperatures (SST) in the North Atlantic Ocean showed a tripolar anomaly pattern—warm SST anomalies over the tropics and high latitudes and cold SST anomalies over the midlatitudes—under the influence of the negative AO. The warm SST anomalies continued into summer 2010 because of the large oceanic heat capacity. A model simulation strongly suggested that the AO-related summertime North Atlantic oceanic warm temperature anomalies remotely caused blocking highs to form over Europe, which amplified the positive summertime AO. Thus, a possible cause of the AO polarity reversal might be the "memory" of the negative winter AO in the North Atlantic Ocean, suggesting an interseasonal linkage of the AO in which the oceanic memory of a wintertime negative AO induces a positive AO in the following summer. Understanding of this interseasonal linkage may aid in the long-term prediction of such abnormal summer events.