



Influence of the snow cover in the Northern Hemisphere on the climate in Western Europe during the cold season

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Latitudinal gradients of temperature and geopotential are large in winter and weak in summer, therefore in the mid latitude regions the prevailing westerly atmospheric flow is strong in the cold season and weak in the warm season. In a planet with continents, stationary Rossby waves are forced by the topographic features. The long waves, forced by the Rockies and by the Himalayas, have their trough at about one quarter of wavelength on the lee side of the mountains. As a result the planetary flow has a positive meridional component over the oceans off the east coast of the continents, and the streamfunction has a north-easterly tilt over the oceans. During winter, when the continents in the NH are colder than oceans, continents act as a diabatic source on the long planetary waves, and therefore they are a negative diabatic source, while the oceans are a positive diabatic source for the air mass in transit. This diabatic perturbation enhances the amplitude of the planetary waves on the lee of the continents, and the north-easterly tilt of the streamfunction over the ocean.

A westerly jetstream separates the cold high latitude air from the temperate mid latitude air. In a planet with continents the jetstream is broken into different branches by the alternate presence of the oceans and of the land masses. In wintertime, because of the thermal gradient between the continents and the oceans, the jetstream off the east coast of the continents is further south than the jetstream off the west coast of the continents. Since the jetstream acts as a waveguide for the winter storms over the oceans, and these storms carry most of the rain to west side of the continents during

the cold season, it is important to evaluate the intensity and the north-easterly tilt of these stormtracks.

The intensity of AO (Arctic Oscillation) is strongly related to the extension of the ice coverage over the polar region, i.e., when the AO is positive the westerly jetstream is generally stronger and at lower latitude. The regional indices NAO (North Atlantic oscillation) and PNA (Pacific North America oscillation) are related to the environmental conditions over the continents and over the oceans. For instance, when it is cold and the snow is abundant over the North American continent, we expect that the NAO is positive, and that the Atlantic storms are, in the average, diverted towards North Europe.

We present preliminary results of a study on the slow variability of the long planetary waves in relation to the environmental conditions over continents in wintertime, mainly in relation to the snow cover over the North American continent and over the Asian continent and results on the teleconnection of the environmental conditions in North America with climate variability in West Europe.