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NORTHERN HEMISPHERE EXTRA-TROPICAL STORM TRACKS : OBSERVATIONS AND PROJECTED CHANGES

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en salle de conférences de Navier

Résumé :

Extra-tropical storm track activity in the Northern Hemisphere is investigated using automated storm tracking and parameter extraction algorithms. Specific, novel details of storm activity climatology and future projections are presented, divided into three main themes, as follows :

a) Present climatology : In the North Atlantic, storm track variations between seasons generally consists of differences in the strength and position of major track features. Summer storms have longer life-spans than their winter counterparts; the Atlantic track corridor in summer is more tightly confined over northern Europe, whereas in winter it is more diffuse; summertime Atlantic storms are found to be slightly weaker but more numerous than in the Pacific. In the North Pacific, the inter-seasonal variability is not as large during the spring and autumn seasons. Most of the storm variables – genesis, intensity, track density – exhibit a maxima pattern oriented along a zonal axis. From season to season this axis undergoes a north-south shift and, in some cases, a rotation to the northeast. Barotropic processes have an influence in shaping the downstream end of storm tracks and, together with the blocking influence of the coastal orography of northwest North America, result in high lysis concentrations, effectively making the Gulf of Alaska the "graveyard" of Pacific storms.

b) The role of sea-ice in the Sea of Okhotsk : Previous studies have shown that sea-ice in the Sea of Okhotsk can be affected by local storms; in turn, the resultant sea-ice changes can affect the downstream development of storm tracks in the Pacific and possibly provide an NAO damping effect in the Atlantic. Results show that, for positive sea-ice concentrations in the Sea of Okhotsk, there is a decrease in secondary cyclogenesis, a westward shift in cyclolysis and changes in the subtropical jet are seen in the North Pacific. In the Atlantic, a negative NAO-like pattern is observed. This pattern is confirmed by the AGCM ECHAM5 experiments driven with above normal sea-ice anomalies in the Sea of Okhotsk.

c) Future projections : The Arctic has undergone substantial changes over the last few decades in various cryospheric and derivative systems and processes. While most agree on the direction of Arctic sea-ice change, the rates amongst the various projections vary greatly. Similarly, the response of storm tracks and climate variability are uncertain, exacerbated possibly by the influence of other factors. A variety of scientific papers on the relationship between sea-ice changes and atmospheric variability have brought to light important aspects of this complex topic. Examples are an overall reduction in the number of Arctic winter storms, a northward shift of mid-latitude winter storms in the Pacific and a delayed negative NAO-like response in autumn/winter to a reduced Arctic sea-ice cover.

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