Climate change and marine infrastructures in Nunavik

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Stud

76°
68°
Ivujivik
Salluit
HUDSON STRAIT
Kangiqsujuaq
Akulivik
Quaqtaq
60°
Puvirnituq
Kangirsuk
60°
UNGAVA BAY
Aupaluk
Inukjuak
Tasiujaq
HUDSON BAY
Kangiqsualujjuaq
Kuujjuaq
NUNAVIK
Umiujaq
Kuujjuarapik
55°
0 50 100 150 200 KM.
55°
76°
68°

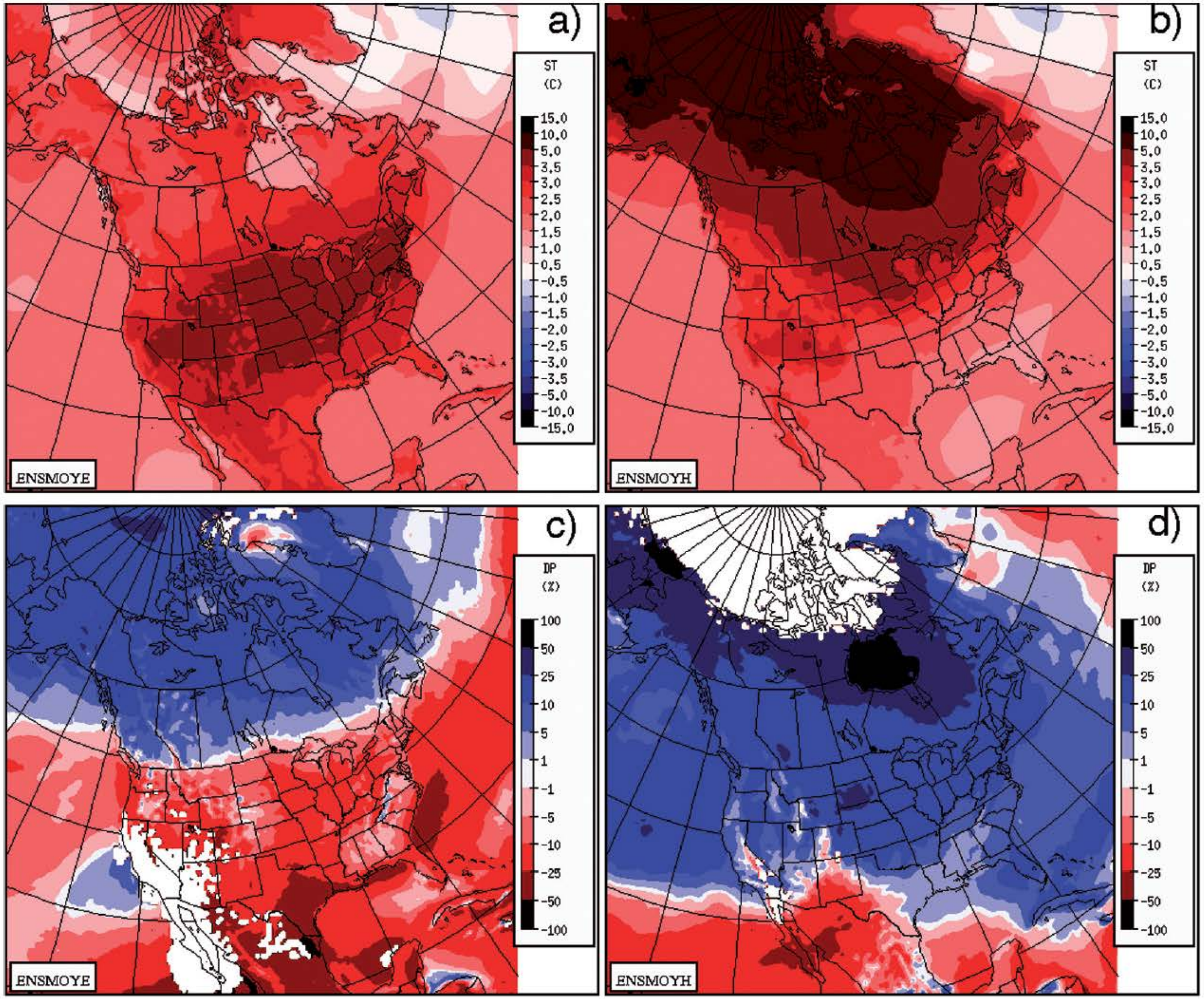


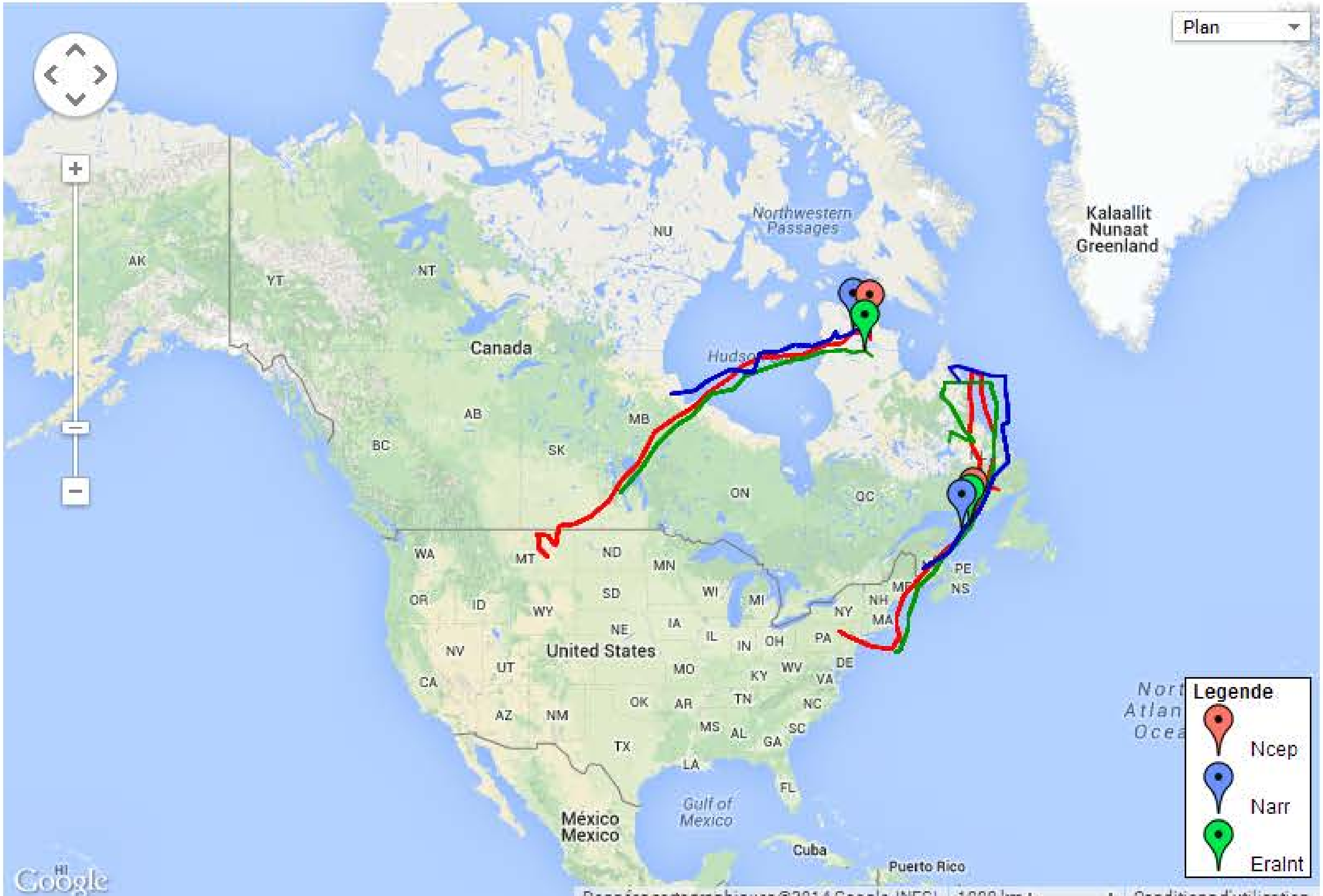
Figure 4: Ensemble mean of the climate change for the seasonal 30-year averages for a) summer mean surface air temperature, b) winter mean surface air temperature, c) summer precipitation and d) winter precipitation. The ensemble is formed by the 18 climate change projections listed in Table 1. Climate change projections are obtained by computing the differences (in degrees C for temperature and % for precipitation) between the future (2041–2070) based on SRES-A2 GHG emission scenario and recent past (1961–1990) seasonal means. Areas where precipitations were below the detection threshold are masked in white to avoid spurious values in relative differences.

RAMÓN DE ELÍA[1,2*] and HÉLÈNE CÔTÉ (2010) stormtrack.ouranos.ca

Instructions: Selectionnez une date de tempete

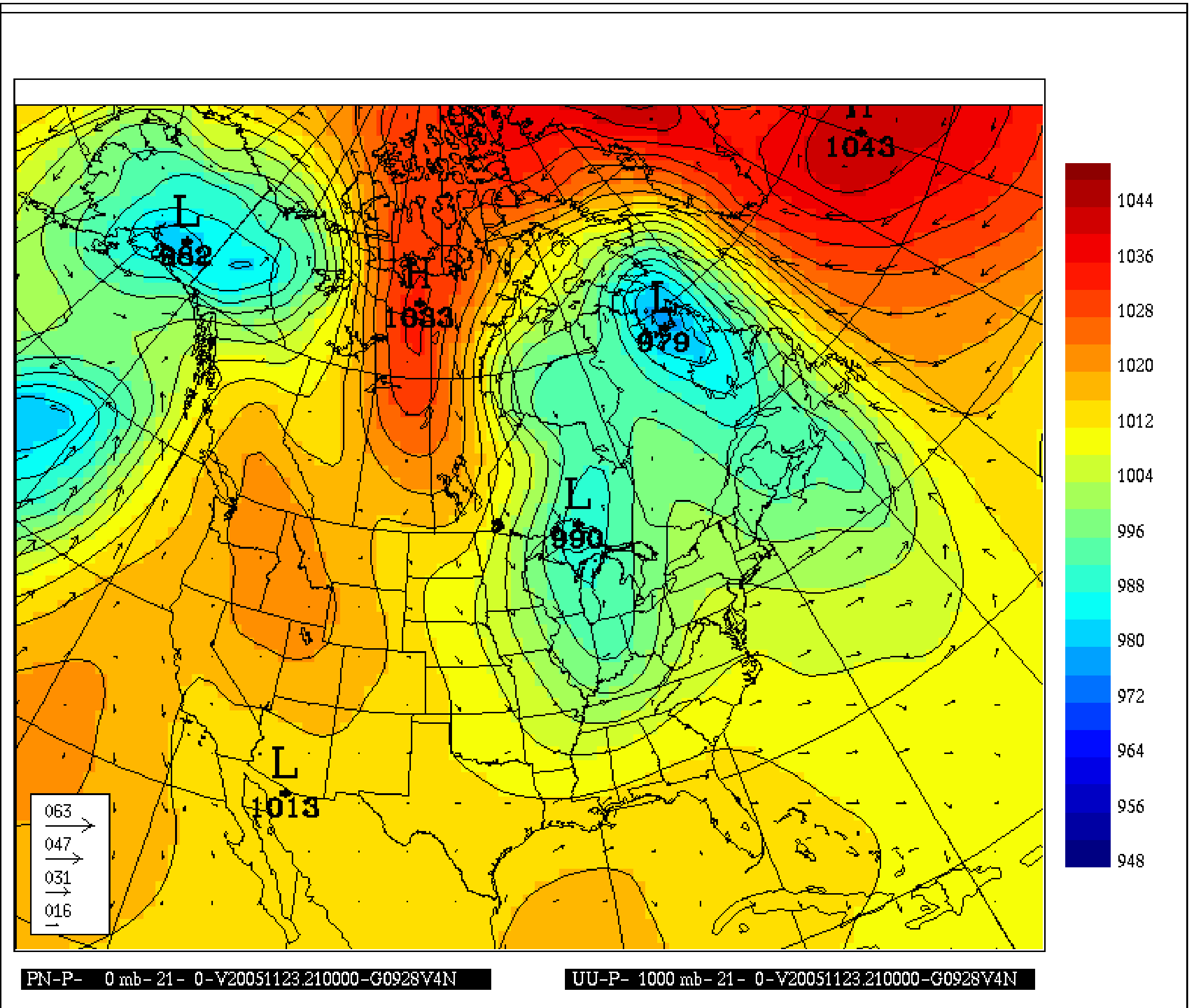
An: 1979 Mois: 01 Jour 01 Heure : 00 Valider

Date selectionee : 2010/10/08 a 00 h



Exemple 1 - 22 novembre 2005

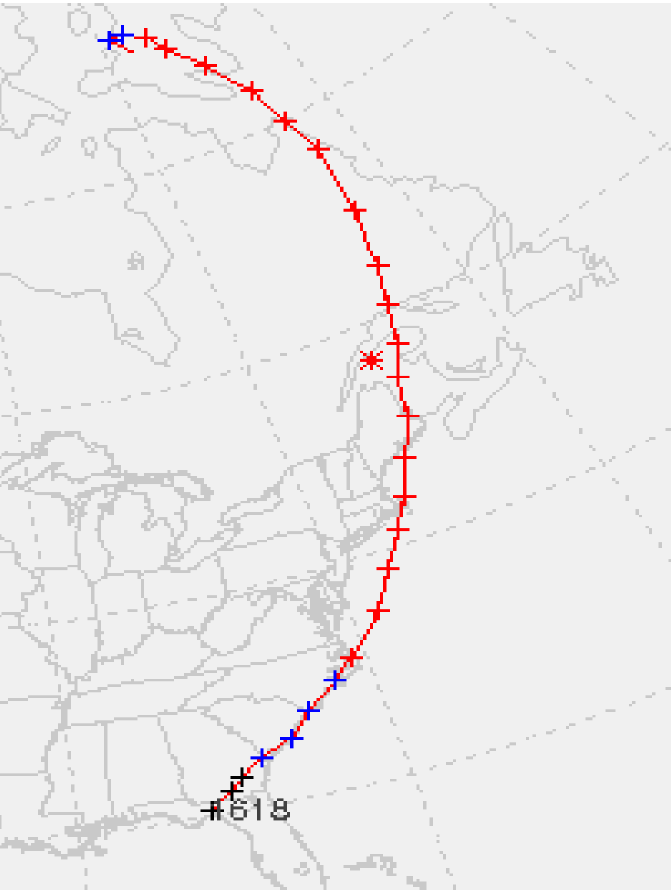
	date	h_v moy	H v max	p_v moy	d_v moy	durée hres
1618:	200511222100	6.8	9.3	9	137	18



noir: tourb < 4.5*1E-5/s

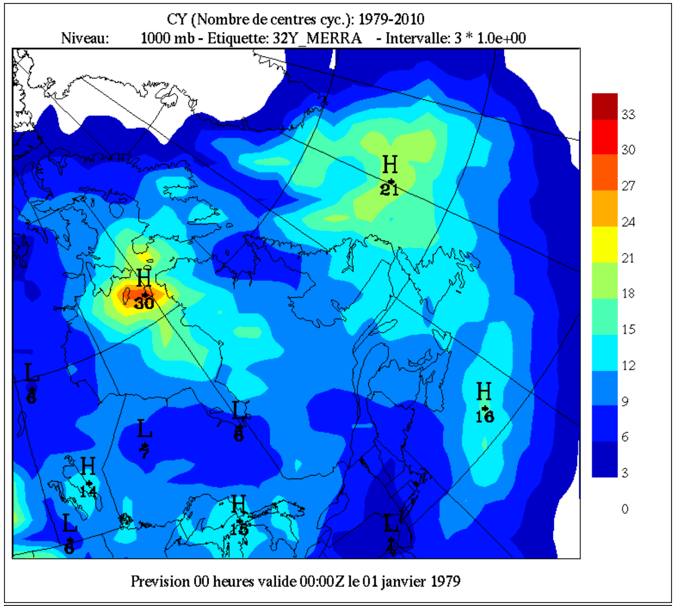
bleu: 4.5*1E-5/s < tourb < 6.5*1E-5/s

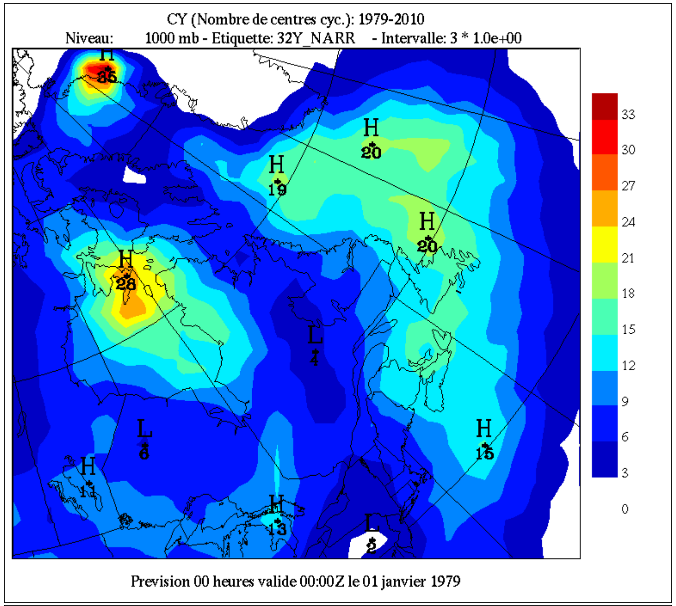
rouge: 6.5*1E-5/s < tourb

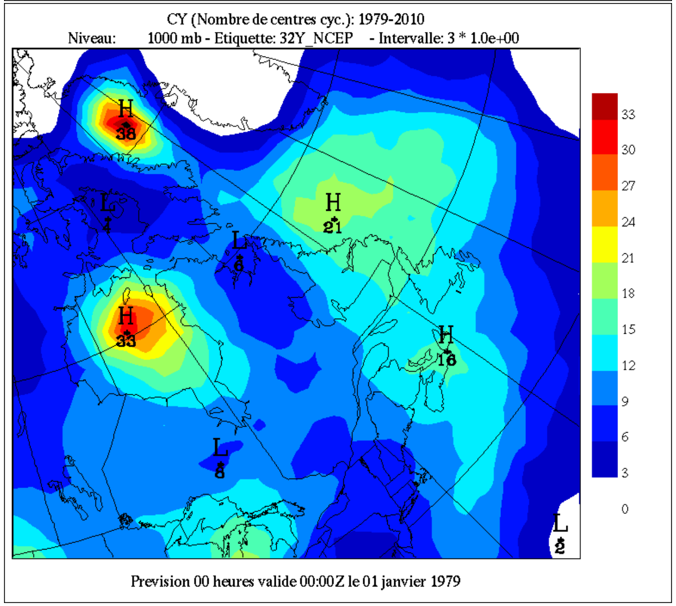


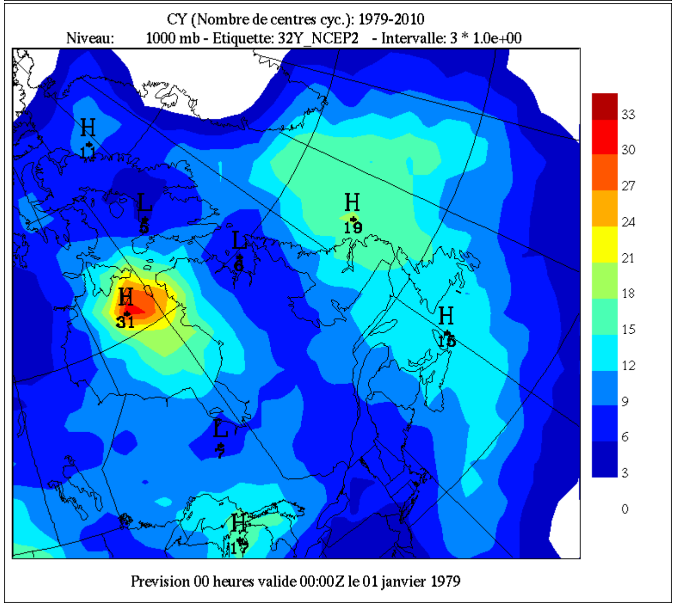
Storm tracking with the Sinclair algorithm

Cyclone centers Density

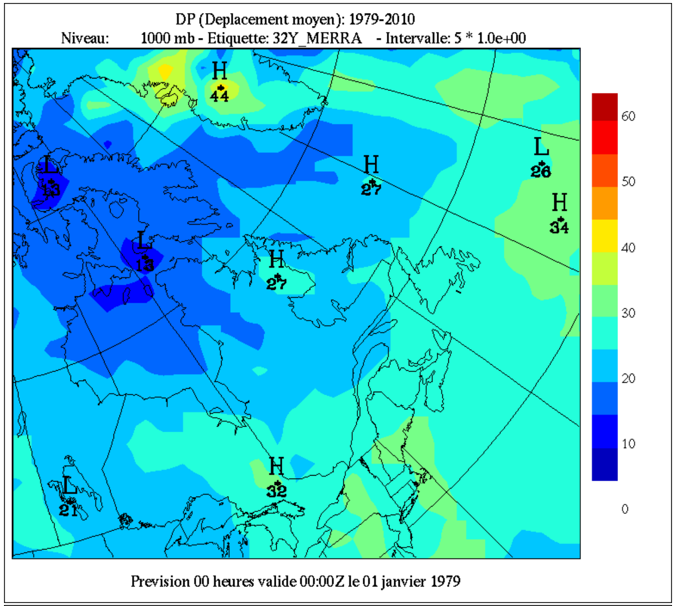


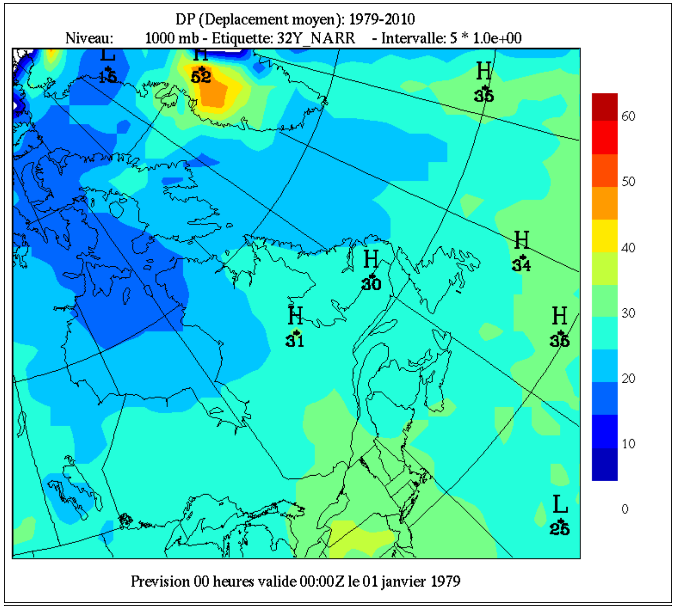


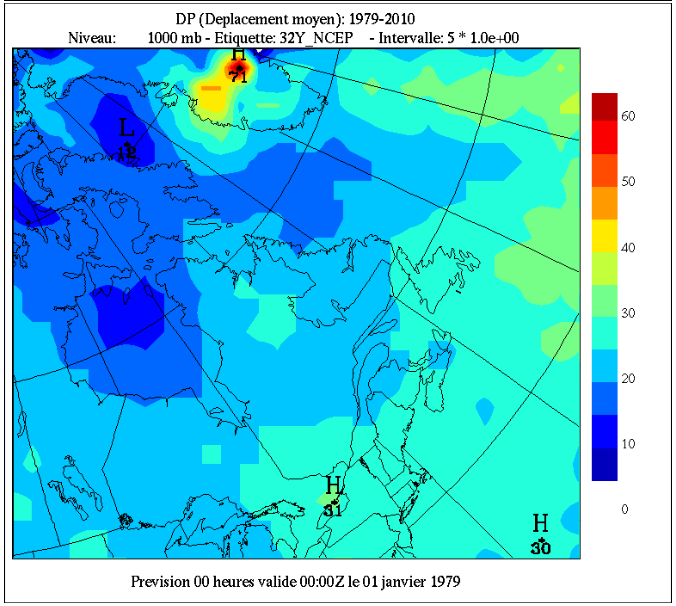


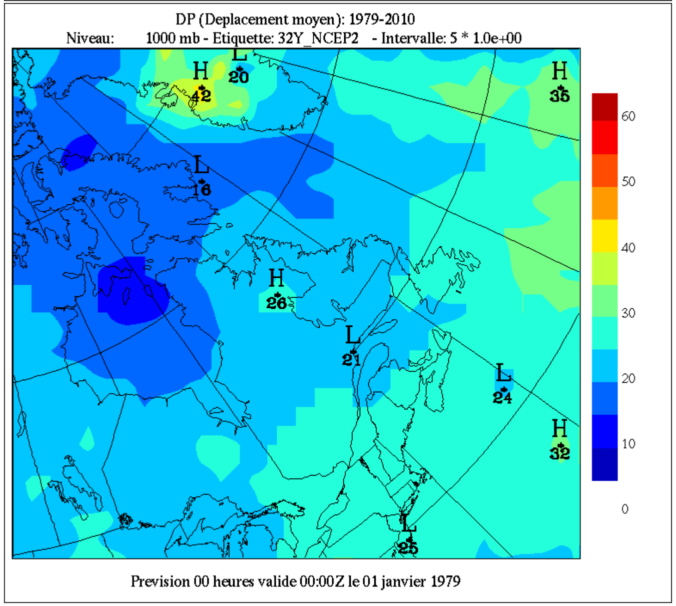


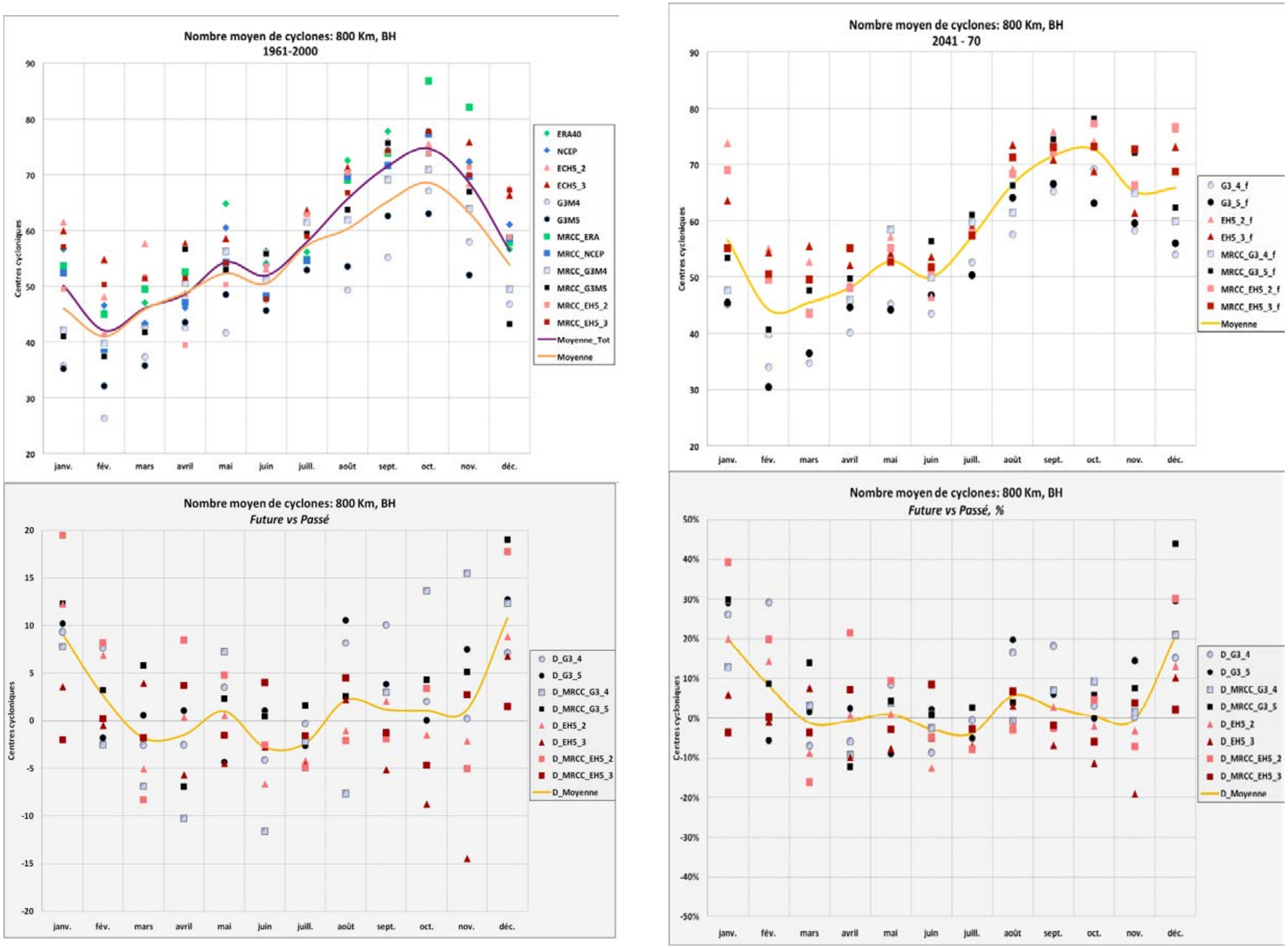
Speed of cyclone centers





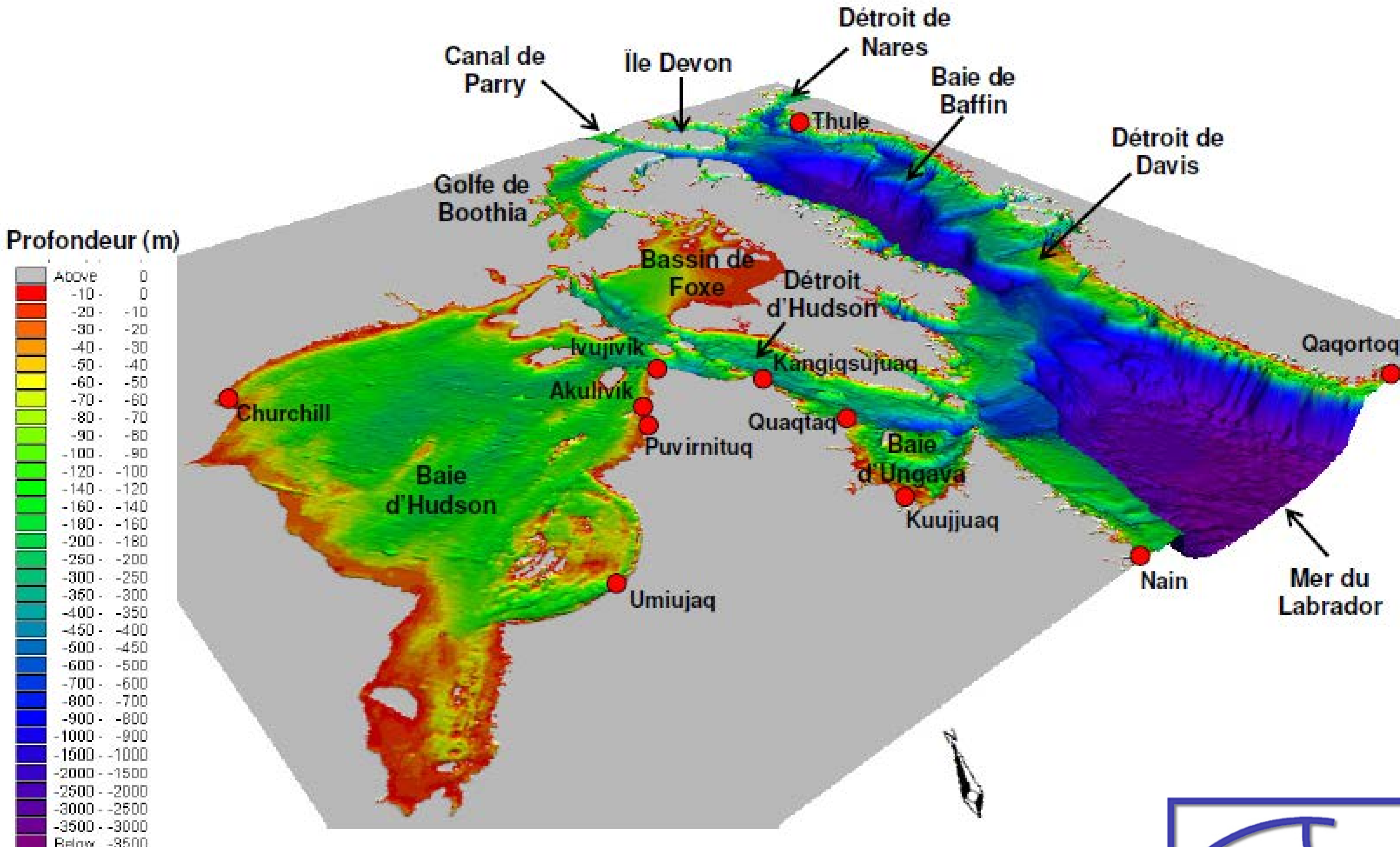




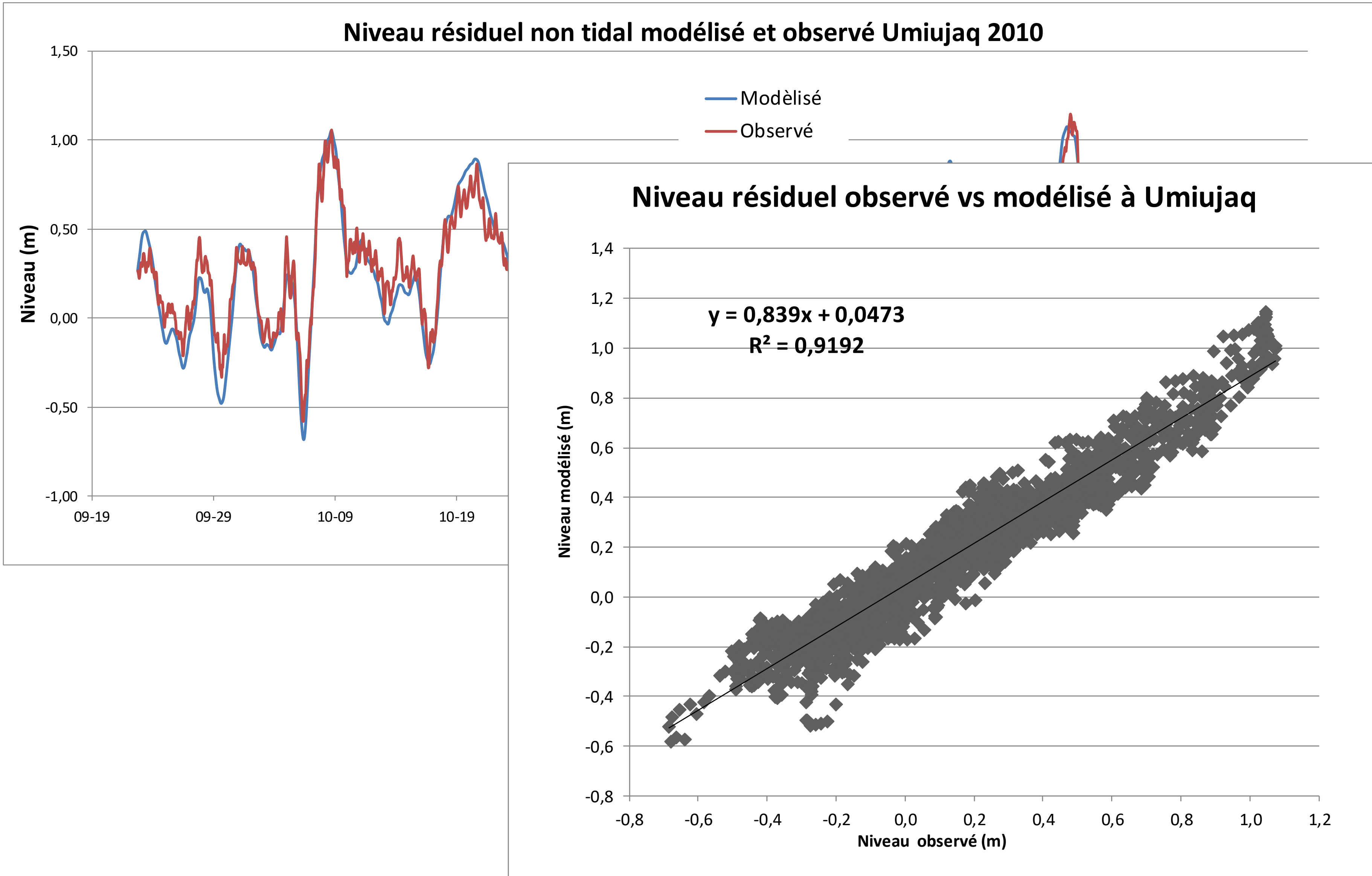


Monthly number of storm centers in the blue circle (800 Km radius) of Hudson Bay; a) 1961-2000; b) 2041-70; c) difference futur minus past in nb cyclone centers; d) same than c in percent. Violet = average for all simulations, yellow = idem without re-analysis.

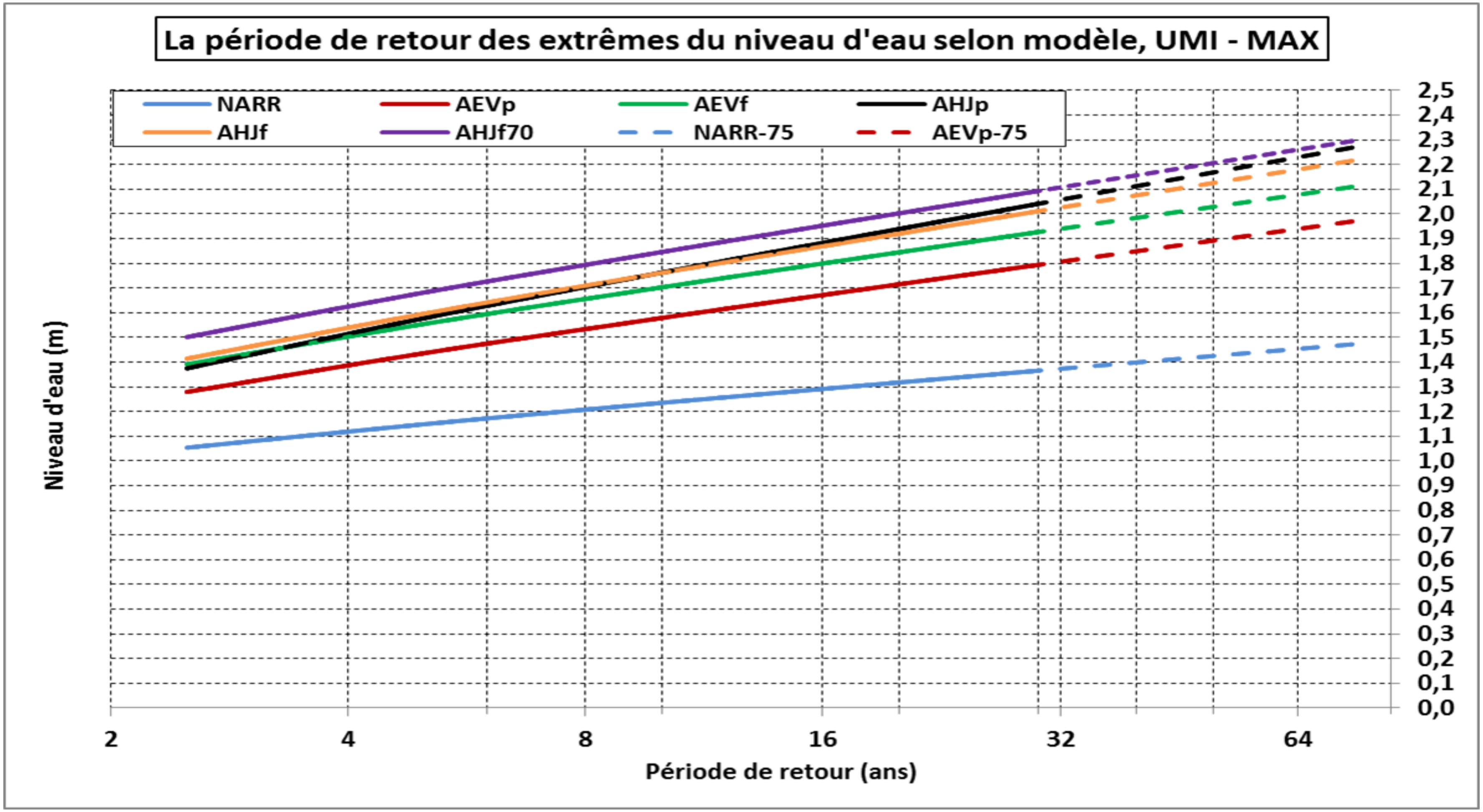
Domain and bathymetry of the storm surge model

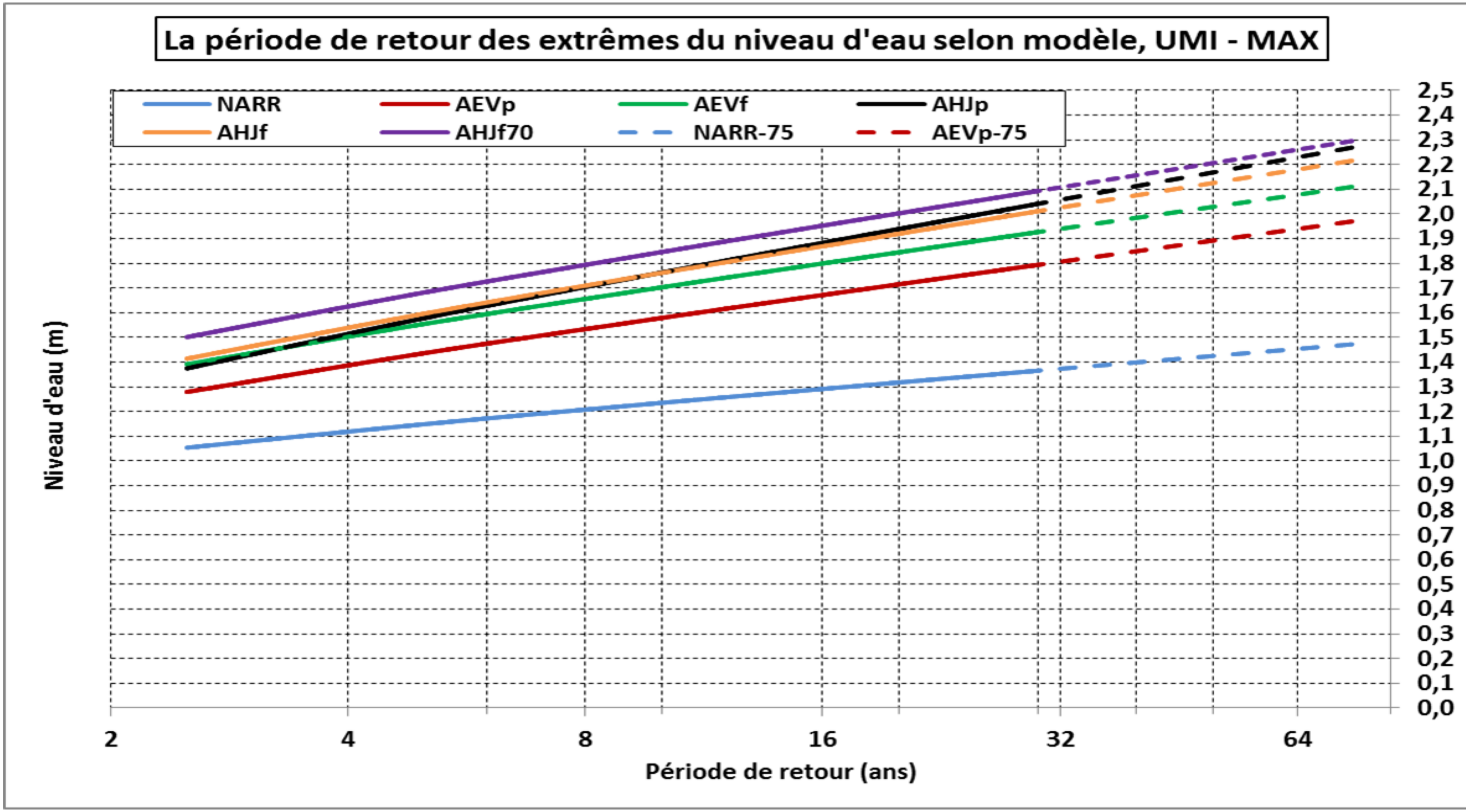


Comparison of non-tidal residual water level modelled and observed at Umiujaq from September to Decembre 2010



Probability of exceedance (monthly averaged) of surge level at Umiujaq: black line is the 1980-2009 period (surge model forced by NARR); the red line is the monthly delta between 2041-2070 and 1980-2009 (surge model forced by MRCC-AEV), this delta is added to the NARR results.





La période de retour des extrêmes du niveau d'eau selon modèle, UMI - MAX
NARR
AEVp
AEVf
AHJp
AHJf
AHJf70
NARR-75
AEVp-75
Niveau d'eau (m)
2,5
2,4
2,3
2,2
2,1
2,0
1,9
1,8
1,7
1,6
1,5
1,4
1,3
1,2
1,1
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
2
4
8
16
32
64
Période de retour (ans)

Conclusions (Storm analysis)

- Climate models simulations show that Canadian Arctic will experience a strong rise of winter temperature (5 and 10 °C). This rate of change in temperature is also happening in Hudson bay and surrounding waters. This is one of the highest warming rate of the world for comparable latitude.
- The summer and winter precipitations will increase everywhere in the Arctic. The highest increase of winter and fall precipitation in 2050 will happens above Hudson Bay.
- The Hudson bay display the highest density of storm centers in Canada, particularly during the fall and early winter.
- Climate change will delay the ice formation and increase the number of storms and the duration of these storms in Hudson Bay.
- The storms travelling throughout Hudson Bay and Nunavik are associated to large surges (high non tidal levels) and large waves observed in the north-eastern shore of Hudson bay.
- The same storms that produce surges in Nunavik coast are also responsible for large waves in the Hudson bay coast of Nunavik.
- The major increase of precipitation in precipitation anticipated for Nunavik and Hudson Bay is to a large part related to additional storminess that will occur in this region.


Thank you
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Source photo:
Transports Québec