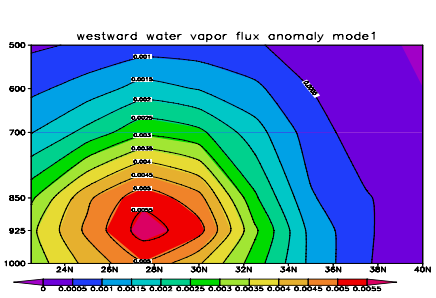
The variation of heat content in the East China Sea and its affection on water vapor and heat transporting to the main continent of China

Jilin Sun， Dexing Wu; Ming Cong，QiaoqiaoWang, Xiaomeng Shi Dedao Shi and Shanhong Gao

(Physical Oceanography Laboratory & Ocean-Atmospheric Interaction and Climate Laboratory, Ocean University of China, Qingdao 266100，China)

Variation and anomalous variation of heat and water vapor transportation from East Marginal Seas of China and the South China Sea to the mainland of China were studied using the atmospheric reanalysis NCEP/NCAR data and oceanic reanalysis data of SODA. Results show that there are obvious characteristic of intedecadal variations in these transportation. When there are more heat content in the East China Sea from after 1990s last century, heat and water vapor were found increased being transported to the mainland of China from over the East China Sea and decreased being transported to the mainland of China from over the South China Sea. The inter-correlation between the westward transportation and the northward transportation were close during the past 50 years. Numerical experiments were done to investigate the reason. It is found that the meridional gradient of sea water heat content in the East China Sea is responsible for the increase trend of westward transport and decrease trend of northward transport. Thus the affection of thermal condition in the East Marginal Seas of China may be worth to be considered in China's climate variation. With observational data, the decreased trend of temperature at Nanjing is explained to be have close relations with the meridional gradient of water heat content in the east marginal seas.



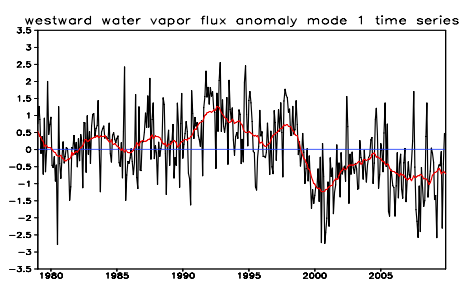
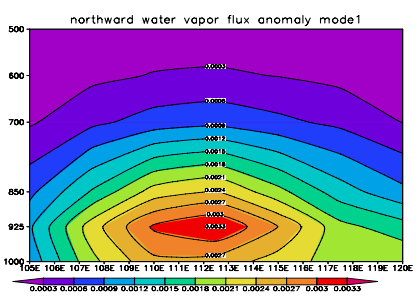


Fig. 1 ***The first EOF mode of anomalous water vapor transport at 120 E. It is obvious that after the later 1990's the westward transport of water vapor is increased especially at the lower level of troposphere. Heat transportation at the section also has the same trend.***



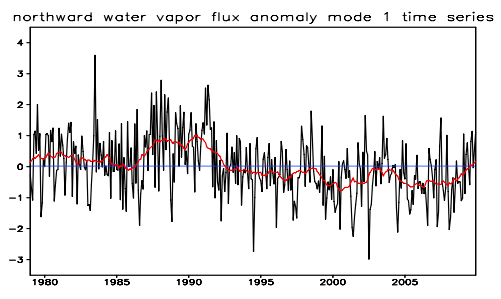


Fig. 2 ***The first EOF mode of anomalous water vapor transport at 22.5 N. It is obvious that after the 1990's the northward transport of water vapor is decreased especially at the lower level of troposphere. Heat transportation at the section also has the same trend.***

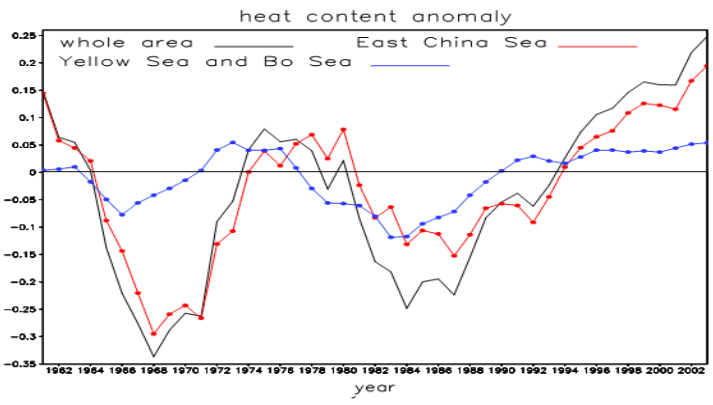


Fig. 3 ***In the decadal time scale， the heat content increasing continually since last 1980s Anomalous heat content is contributed by East China Sea (about 94%)。***

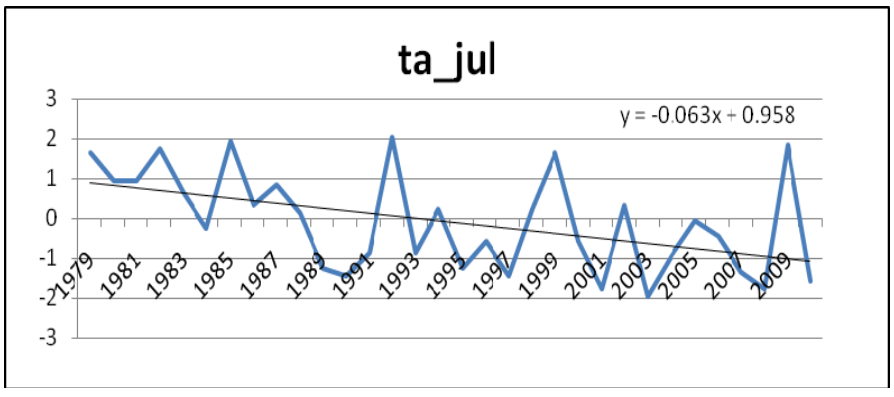


Fig. 4 The monthly air temperature anomaly in July at Nanjing. It is obvious that there is an decrease trend after 1979

By correlation analysis between air temperature anomaly at Nanjing and sea level wind anomaly over Yellow Sea, there are close relations between the strengthening of northeast wind and the decrease of air temperature at Nanjing. Correlation coefficients are 0.396 (U and Ta)and 0.507(V and Ta)，confiendence are beyond 95% and 99%, respectively.

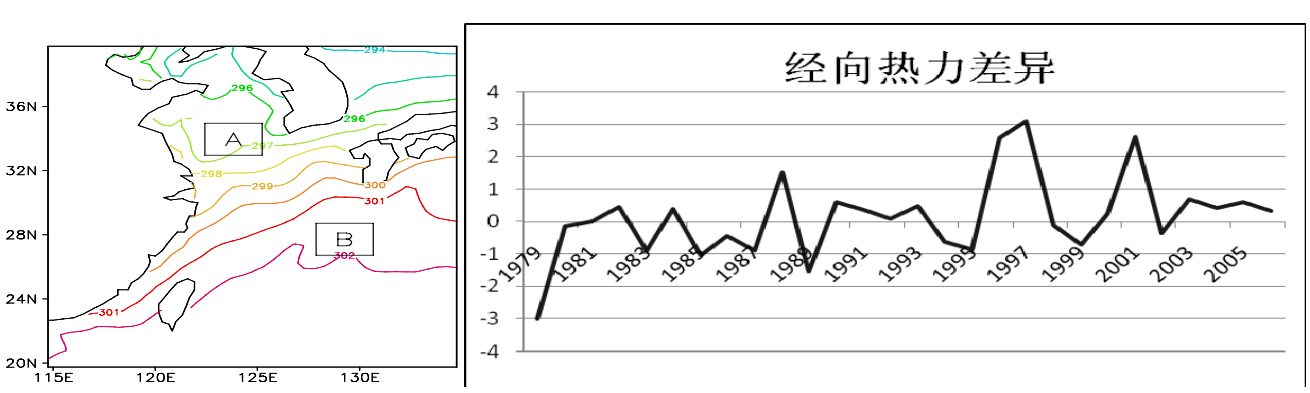


Fig. 5 ***The horizontal heat content difference between the East China Sea (region B) and Yellow Sea (region A).***

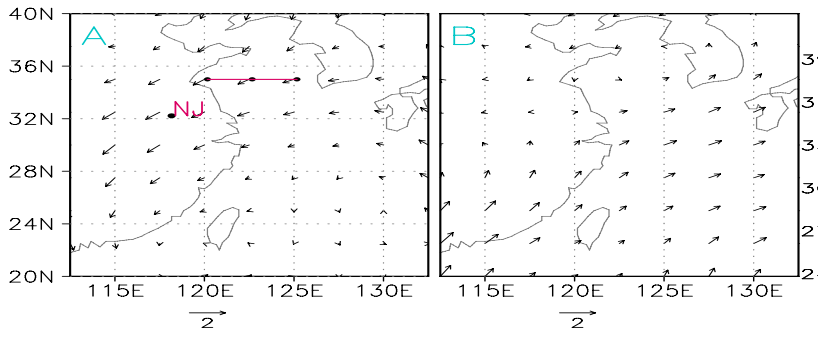


Fig. 6 ***The Anomalous wind at 925hPa during July at strong heat content gradient year (left) and at weaker heat content gradient year (right).***

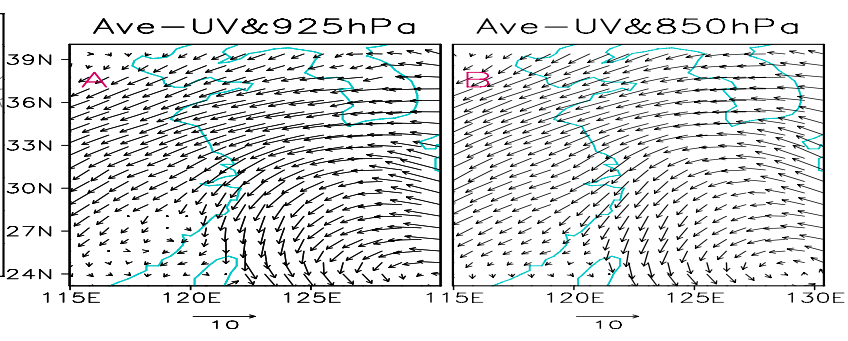


Fig. 7 Difference of anomalous wind between strong heat content gradient year and weaker heat content gradient year at 925hPa (left) and at 850hPa (right) during July in numerical assimilation with WRF model（Units：m/s）

Numerical model experiments showed that, the strengthening of meridional gradient of heat content in the east marginal seas can drive stronger northeast wind to the mainland of china at the lower level of troposphere. The mechanisms are: more convection is enhanced over the East China Sea and downward vertical movement in the lower troposphere. With the rotation effect of the Earth, the anomalous wind over the Yellow Sea turn its direction to the mainland of China.