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Variability of heat flux toward the Arctic Ocean from nearly decadal measurements by an array of moorings in Fram Strait.

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During the last decade a significant warming of the Atlantic water (AW) and pronounced changes in the structure and strength of the AW flow resulted in a strong increase of the heat flux into the Arctic Ocean. Long-time measurements, which have been carried with the array of moorings in Fram Strait since 1997 in the framework of the VEINS and ASOF-N EU-projects, revealed that the heat flux increase was due to two strong anomalies observed in 1998/99 and 2003/2004. The excess of heat transported northward through Fram Strait was mostly attributed to the strong increase of heat carried by the West Spitsbergen Current (WSC). During the first anomalous period the increase in temperature and strengthening of the northward current contributed equally to the heat flux increase in the WSC with changes in the local air-sea heat exchange and advection. The second anomaly was generated almost exclusively by advection of the warmer AW from the North Atlantic. The relative contributions from temperature and northward current variations to the observed heat flux anomalies are examined on the different timescales. Prominent changes in the circulation pattern in Fram Strait are also observed during the last two years when the AW recirculation was much stronger and extended much farther to the west than in previous years. The strong warming found in the recirculation area in 2005 can possibly be attributed to the anomalously warm AW which had passed the mooring section the year before and later recirculated north of Fram Strait. Additionally the mean temperature measured at the mooring section in 2003-2005 by temperature sensors in the water column is compared to estimates from Inverted Echo Sounders to evaluate the ability of the latter for heat flux monitoring.