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Recent changes in surface water extent over the Northern latitudes.

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All climate scenarios agree on the high sensitivity of the northern regions to global change, with a stronger warming at these latitudes than globally. Continued warming will likely have profound consequences for many continental systems throughout the region. In particular, an increase in air temperature is expected to intensify the Arctic hydrological cycle. As a key parameter of the global biogeochemical and hydrological cycles, terrestrial surface waters (rivers, lakes, man-made reservoirs, wetlands and episodically inundation) are of a particular importance because they interact directly with the ocean and atmosphere. Using a multi-satellite method, including passive microwave land surface emissivities, along with active microwave, visible and near infrared observations developed to estimate inundated area at global scale, we present here the recent changes observed in surface water extent in Northern latitudes over the period 1993-2004. Over these regions, results show a decline in surface water extent with large geographical contrasts between Eurasia and America, between the different large river basins and between the regions underlain or not by permafrost. For six major basins located in Eurasia and North America, we analyze theses changes in comparison with precipitation, temperature and in-situ river discharge variations. The Yenissey and the Lena river basins, which are largely underlain by permafrost, show the largest changes in surface water extent especially in July/August with a decline of about 1-2% per year. Our results support the idea that more deeply thawed permafrost, due to temperature increase in the Boreal regions, would promote increased soil infiltration and a possible shift of water storage from the surface/near surface to the subsurface. The implications of these results in term of energy, biochemical and water cycles will be discussed.