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Global-scale surface salinity change since the 1870s.Implications for the global hydrological cycle

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Based on the first ever combined analysis of observations from the round-the-world voyages of HMS Challenger and SMS Gazelle in the 1870s, early in the industrial era, this paper shows that the amplification of the global surface salinity signal (saline areas becoming saltier and fresh areas fresher) has increased by 63±5% since the 1950s compared to the period 1870s to 1950s. Other analyses of regional salinity change between the mid-20th century and present day have linked this amplification to anthropogenically-driven strengthening of the global hydrological cycle in line with increasing global temperatures. Our results show that the rate of change has indeed accelerated but more closely in line with changes in sea surface temperature than with surface air temperature over almost 150 years. This is the first global-scale analysis of salinities from these two expeditions in the 1870s and the first observational evidence of changes in the global hydrological cycle since the late 19th century.