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The fate of Earth's ocean

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Abstract. Questions of how water arrived on the Earth's surface, how much water is contained in the Earth system as a whole, and how much water will be available in the future in the surface reservoirs are of central importance to our understanding of the Earth. To answer the question about the fate of the Earth's ocean, one has to study the global water cycle under conditions of internal and external forcing processes. Modern estimates suggest that the transport of water to the surface is five times smaller than water movement to the mantle, so that the Earth will lose all its sea-water in one billion years from now. This straightforward extrapolation of subduction-zone fluxes into the future seems doubtful. Using a geophysical modelling approach it was found that only 27% of the modern ocean will be subducted in one billion years. Internal feedbacks will not be the cause of the ocean drying out. Instead, the drying up of surface reservoirs in the future will be due to the increase in temperature caused by a maturing Sun connected to hydrogen escape to outer space.

Keywords: Surface water reservoir, water fluxes, regassing, degassing, global water cycle

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