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On the statistical properties of sea ice lead fraction and heat fluxes in the Arctic

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Heat flux through leads and polynyas is an order of magnitude larger than that through unbroken ice. In this paper we explore some statistical properties observed in Arctic sea ice lead fraction, and the resulting modelled heat fluxes. We show that the model reproduces well the probability density function (PDF) and the monofractal spatial scaling of observed lead fluxes in the Central Arctic. We then explore the PDF and spatial scaling of simulated heat fluxes, showing that the heat fluxes have a multifractal scaling in the Central Arctic which we attribute to lead formation, while coastal polynyas destroy the scaling in the wider Arctic. Finally we show that the scaling of simulated lead fraction is preserved for different model resolutions, while further work on a sub-grid scale parametrisation of surface heterogeneity is required to preserve the scaling of heat fluxes for different model resolutions.