Deep insights to the Greenland ice sheet by linking multichannel ultra-wide-band radar surveys to the latest deep ice cores by synthetic radar modelling

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For the past decade, multi-channel ultra-wide band radar systems are the key tool for deciphering the internal architecture of ice sheets, as they for the first time record traceable layers from the echo free zone. It enabled high resolution tectonic studies of folding especially in relation to drainage glaciers and establishing the internal architecture all over Greenland. To undertake processes studies in the ice sheet the layer genesis has to be understood on a microphysical scale. Synthetic radar trace modelling based on the dielectric profile of ice core records exploits the full potential of assigning physical properties' variations as observed in the ice core on the decimetre scale to radar reflectors extending from the coring site – in favourable cases – through vast flow regimes or even the entire ice sheet. In this paper we compile the available dielectric profiling (DEP) data of the latest Northern Greenland deep ice cores of NGRIP – with the oldest undisturbed record in Greenland back to 122 kyr b2k, NEEM – with oldest reconstructed record from a folded core - and EastGRIP – the first ice core from the onset of the NEGIS ice stream, presently draining about 12% of the Greenland ice sheet. The three cores are the best and exhaustive basis for assigning an age model to the Northern Greenland radar mapped architecture and linking up the reflector properties to observations in the core. Our established link between observed millimetre and sub-millimetre scale physical properties and the over Northern-Greenland extending reflectors will serve as the basis for much deepened insight to the tectonics and a much more profound accumulation and flow history of the Northern part of the Greenland ice sheet.