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A wireless subglacial probe for deep ice applications

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We present the design and first results from two experiments of a wireless subglacial probe system (WiSe) that is able to transmit through 2500 m thick ice. The probes transmit data every 3 minutes and by minimizing energy consumption they are foreseen to do so for at least 10 years. In July 2010 the system was employed for the first time and used to measure subglacial pressure at the base and a temperature profile consisting of 23 probes in two 600 m deep holes at Russell glacier near Kangerlussuaq, West-Greenland. During the period July 2010 to March 2011 we observe very good agreement between the wireless and wired reference pressure measurements in two different holes about 4 m apart. After this period the time series gradually start to deviate probably as a result of changes in their connection to the hydraulic system. As a reference to the temperature profile we compared the wireless data to the theoretical decrease of the melting point with water pressure inside the hole directly after the start of the experiment showing a fairly good agreement. The second experiment was performed in the 2537 m deep hole at NEEM in June 2011 to test the depth range of the wireless system. By applying probes with sufficient transmission power and a proper surface antenna configuration the wireless system is able to transmit data through 2500 m thick ice.