Datashare 122

Underpressure in the northern Barents shelf: Causes and implications for hydrocarbon exploration

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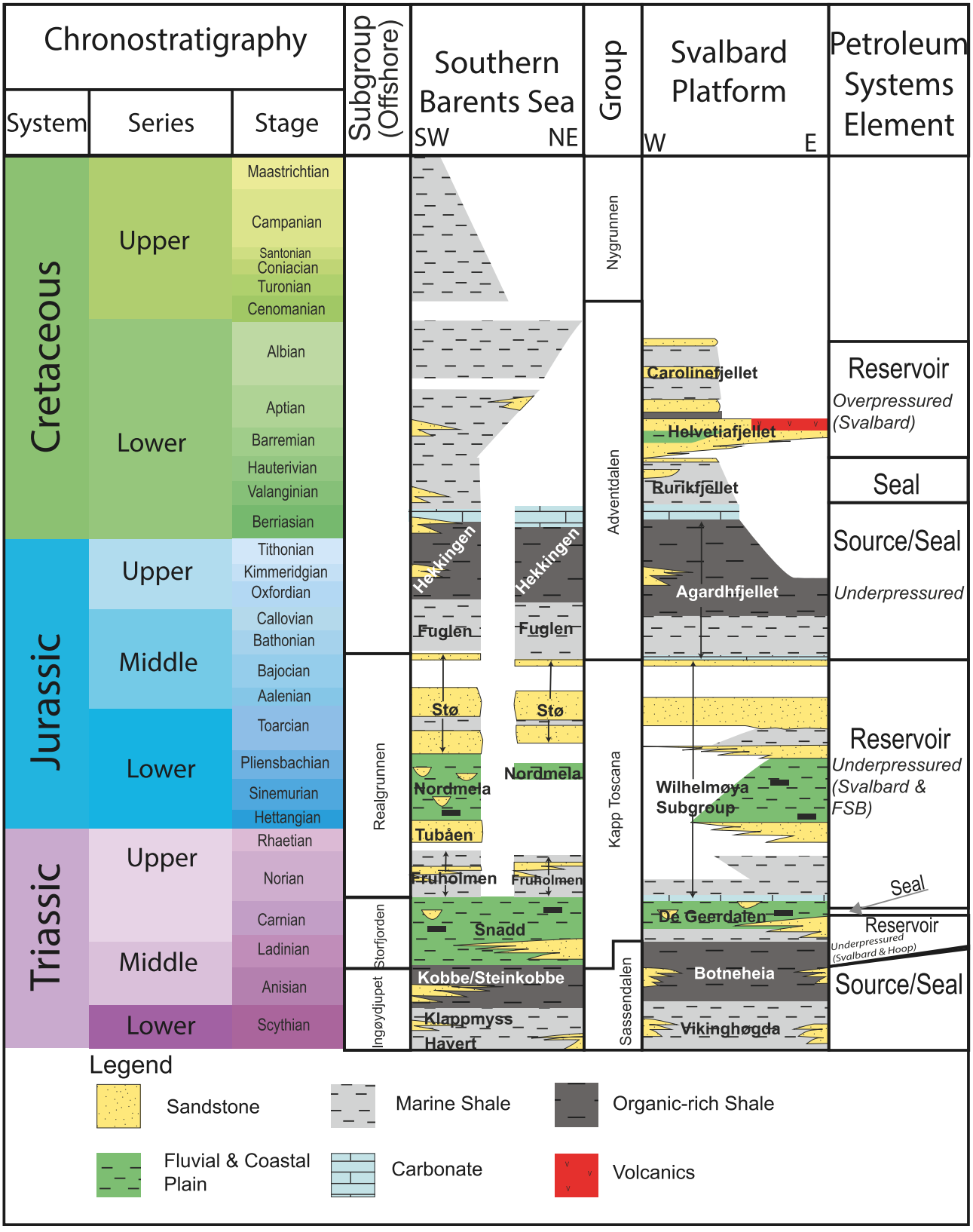

Figure S1. Mesozoic stratigraphy and petroleum system elements of the Barents Sea and Svalbard (modified from Gradstein et al., 2012, 2010; Worsley, 2008). Note that in this contribution, we refer to the Knorringfjellet, Svenskøya, and Kongsøya Formations collectively as the Wilhelmøya Subgroup. Thicker black rectangles denote carbonaceous intervals. FSB = Fingerdjupet subbasin.

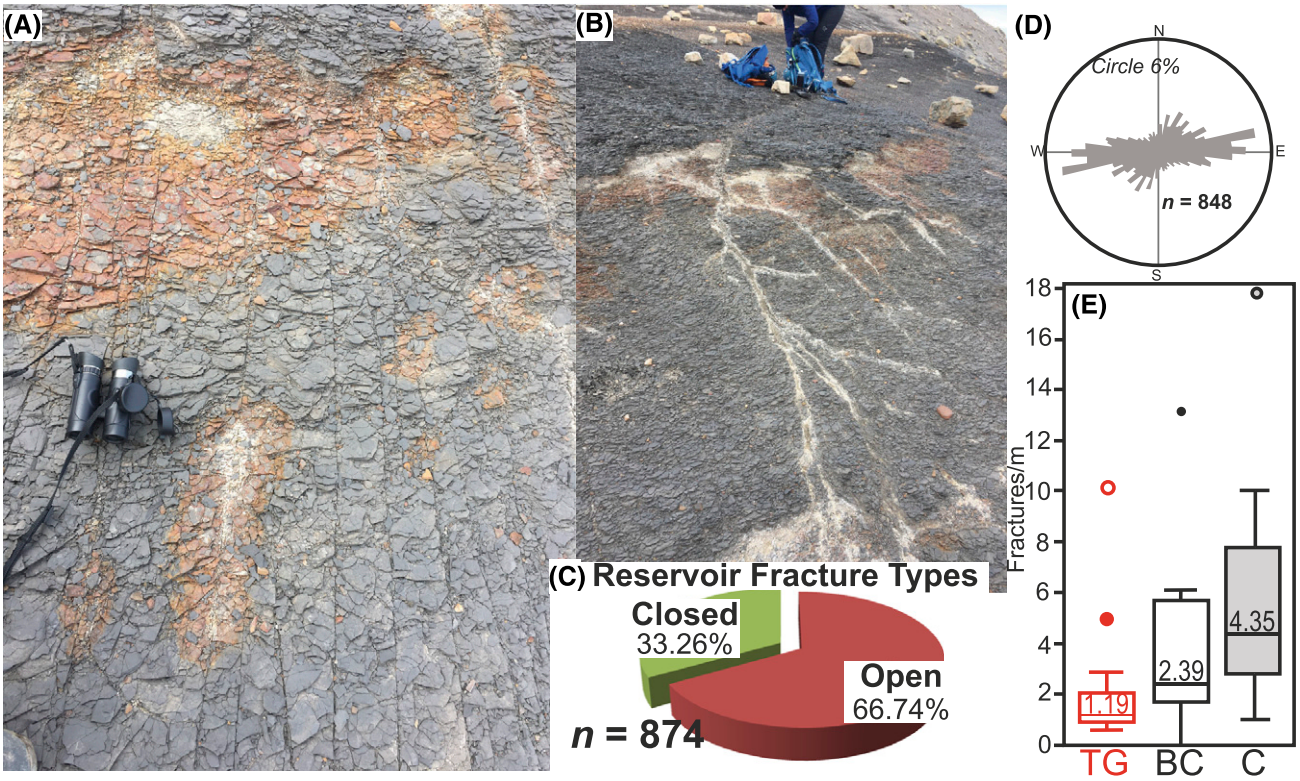

Figure S2. Fractures in the top seal and reservoir. (A, B) Fractures of the Agardhfjellet Formation top seal in outcrop. (C) Proportion of open and closed fractures in the Wilhelmøya Subgroup and De Geerdalen Formation reservoir interval. (D) Fracture orientation in Agardhfjellet top seal. (E) Fracture intensity of the Agardhfjellet Formation. Dots represent outliers. From Ogata et al. (2014). BC = bed-confined; C = combined; TG = throughgoing.

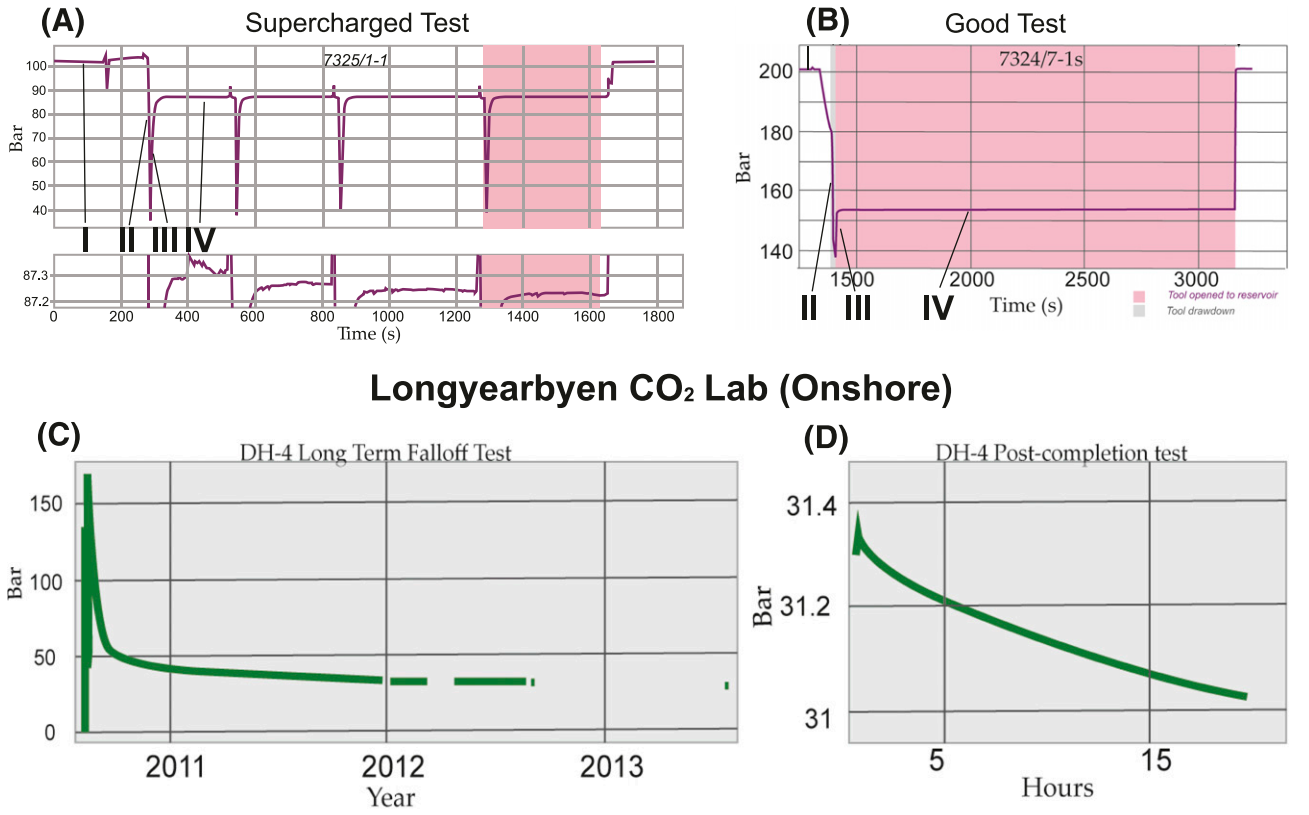

Figure S3. Pressure buildup plots from offshore and in Svalbard. (A) A supercharged test from the Atlantis gas discovery showing pressure drop in each test cycle. (B) A cycle from a good pressure test in well 7324/7-1s (s indicates deviated well). (A, B) (AI, BI) Tool open and observing pressure of the drilling mud. (AII, BII) Tool is pressed against the sidewall, through the mud drawn down. (AIII, BIII) Pressure builds as reservoir fluid enters tool. (AIV, BIV) Pressure stabilizes to formation pressure. (C) Long-term monitoring of pressures in well drill hole 4 (DH-4) in Svalbard after water injection. (D) Pressure data in DH-4 immediately after well completion showing supercharging.

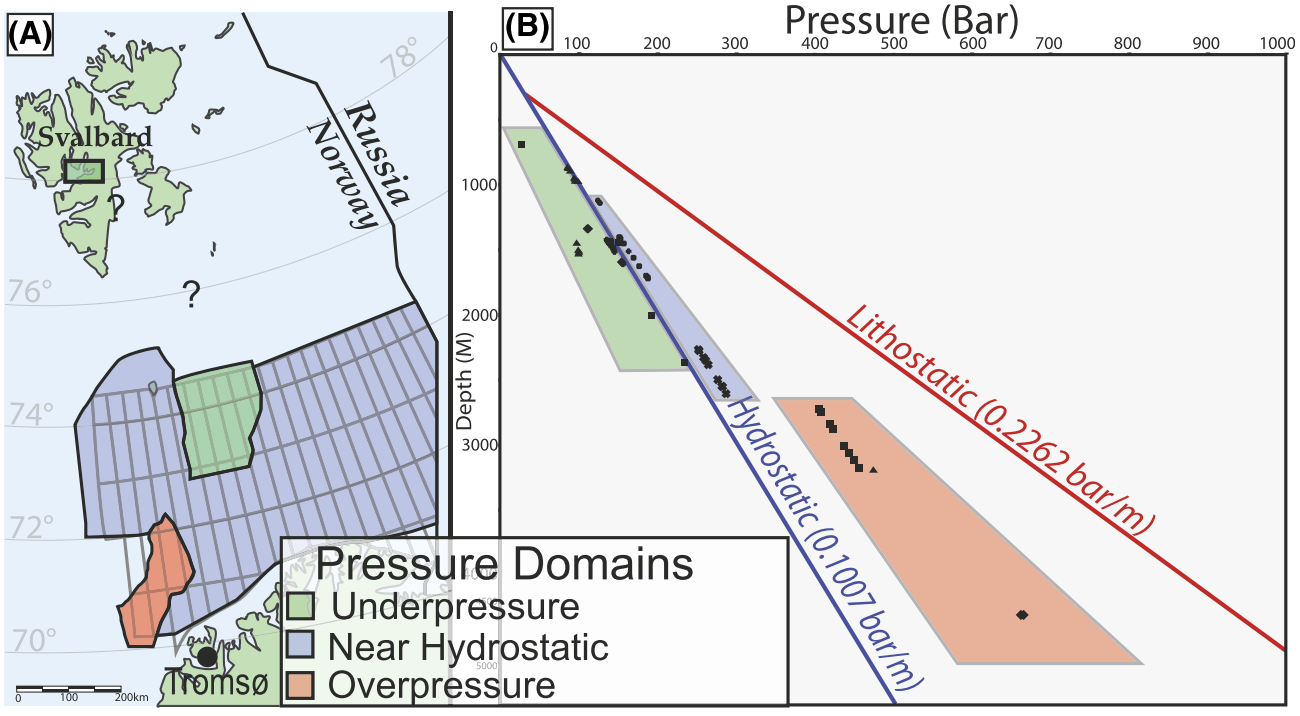

Figure S4. The Barents Sea pressure trends. (A) A map of the pressure trend distribution. (B) Selected examples of pressures from each domain. Different shapes represent direct pressure measurements from selected wells in each area.

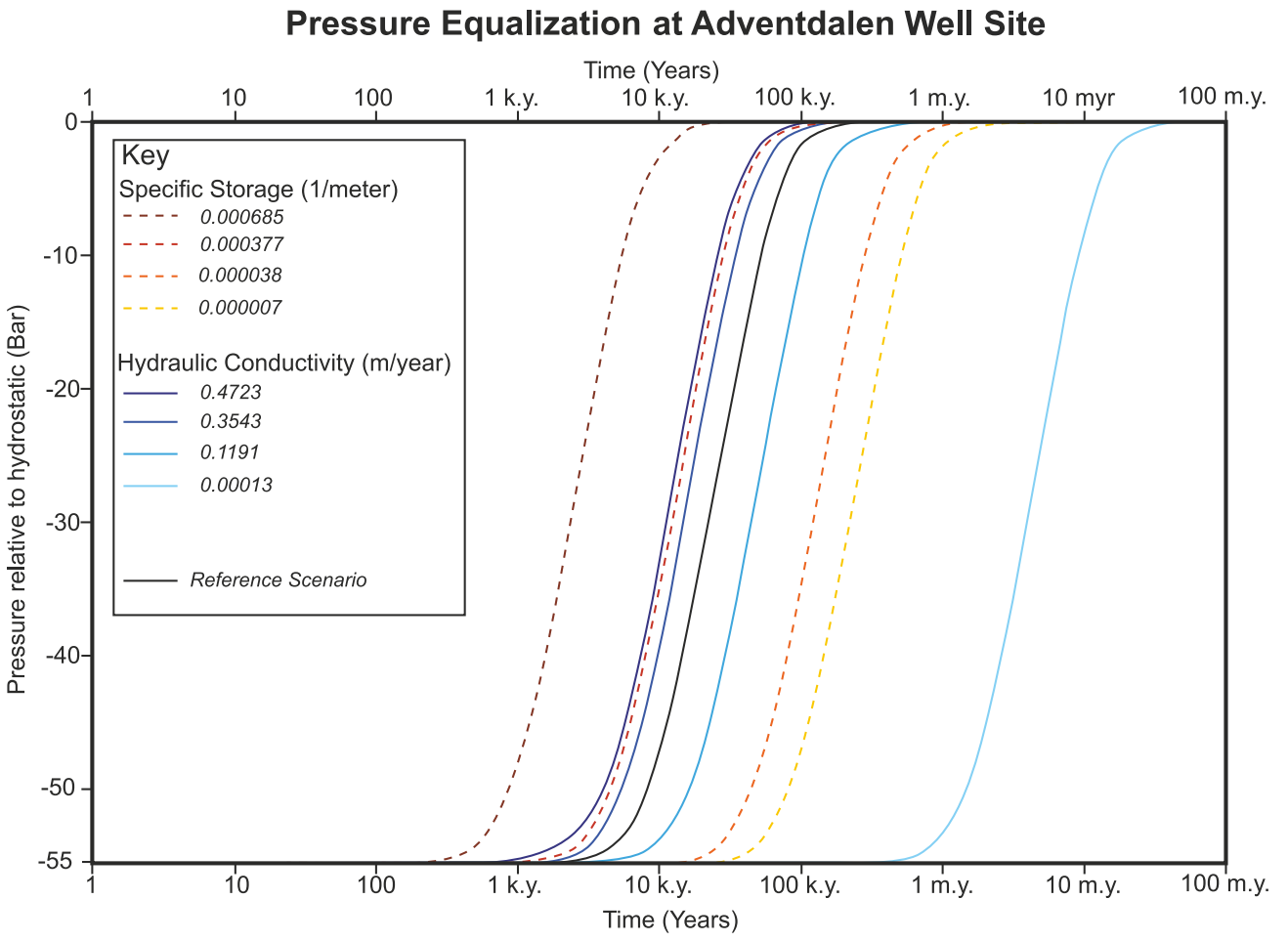

Figure S5. Sensitivity of specific storage and hydraulic conductivity for lateral pressure equilibration between the Adventdalen well site and outcrop through the reservoir interval. When varying one parameter, the other remained at the reference scenario value.
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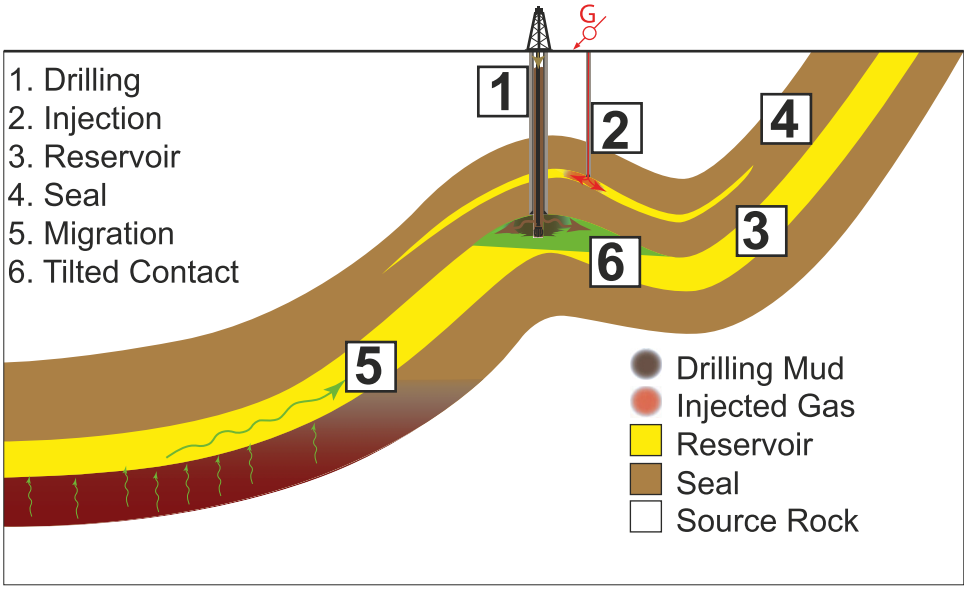

Figure S6. Elements of the petroleum system and drilling processes potentially affected by underpressure. 1 = Drilling complications; 2 = Gas (G) or other injection well challenges, including CO_2 injection (red lines); 3 = Impacts on reservoir behavior; 4 = Impacts on seal capabilities; 5 = Influence on migration (green lines); 6 = Formation of tilted contacts.