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Recurrent fault-valve behaviour detected by strain measurements in N-Adria

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The data recorded by the NE-Italy tilt/strain gauges network in the time interval 1982-1996 (Braitenberg, 1999) have been analysed at the light of the results of the analyses of Rossi et al. (2016; 2017; 2018) of the cGNSS at the northern tip of the Adria microplate. In fact, they reported the occurrence of a transient signal propagating through the region, inducing a tilting along the principal tectonic structures in the various sites between 2006 and 2009. They interpreted the signal as bound to the propagation of fluids as a porosity wave, bound to a valve behaviour (Sibson, 1992) of the Ravne Fault (Slovenia), recognized responsible for the Bovec-Krn seismicity. According to Sibson's model, faults that act as impermeable seals except in the post-failure phase, when they allow fluid discharge, may behave as fluid-pressure activated valves when cutting a supra-hydrostatic fluid pressure gradient. Such interpretation is supported by the values of the hydraulic diffusivity, and permeability inferred from the arrival times of the transient signal in the different cGNSS stations, consistent with the lithologies present in the area.
We considered the most extended time series of the NE-Italy tilt/strain gauges network, in which long-term oscillations were observed (Rossi and Zadro, 1996). A transient oscillation appears to be present in the recordings of four tiltmeter sites, revealing a tilting along the tectonic features in the period 1984-1990. By using the same tomographic approach and the model of Rossi al. (2016; 2017), we located the transient's source as originated in correspondence of the South Alpine thrust front, near its intersection with the Idrija fault, in western Slovenia, not far from the source identified by Rossi et al. (2016). The area, hence, would be confirmed as a source of fluid diffusion. The various thrusts and transpressive structures, involving dolomitic limestones and terrigenous flysch formations, can act as barriers, generating overpressure conditions, and, from time to time, enable fluid diffusion in the surroundings.