There is increasing evidence that volcanic eruptions and significant earthquakes may be related. Changes in Coulomb failure stress explain the triggering of earthquakes, however, it is not understood how stress changes trigger volcanic eruptions. When a system has evolved to a critical state it is very sensitive to small perturbations of the stress field. Small stress changes can trigger a sequence of events that eventually lead to an eruption. We do not yet know which the controlling mechanism is.

Karymsky, Kamchatka, erupted in January 1996, and was preceded by a significant Mw7.1 left lateral strike slip earthquake about 20 km to the south. We use a distributed slip model and predict co-seismic Coulomb stresses and pressure changes. Predicted change in Coulomb stress encourage failure along a line in-between Karymsky and Akademia Nauk, a location which well fits the observed surface fractures. Pressure change models show an area of decreasing pressure, again, just in-between Karymsky and Akademia Nauk.

We show that the 1996 earthquake-eruption pair thus contrasts to other known volcano-earthquake pairs, such as at Pinatubo 1991 that followed an M7.7 earthquake. The 1996 Karymsky eruption appears to be triggered by a pressure decrease whereas the 1991 Pinatubo eruption may have been triggered by pressure increase at level of the magma reservoir.