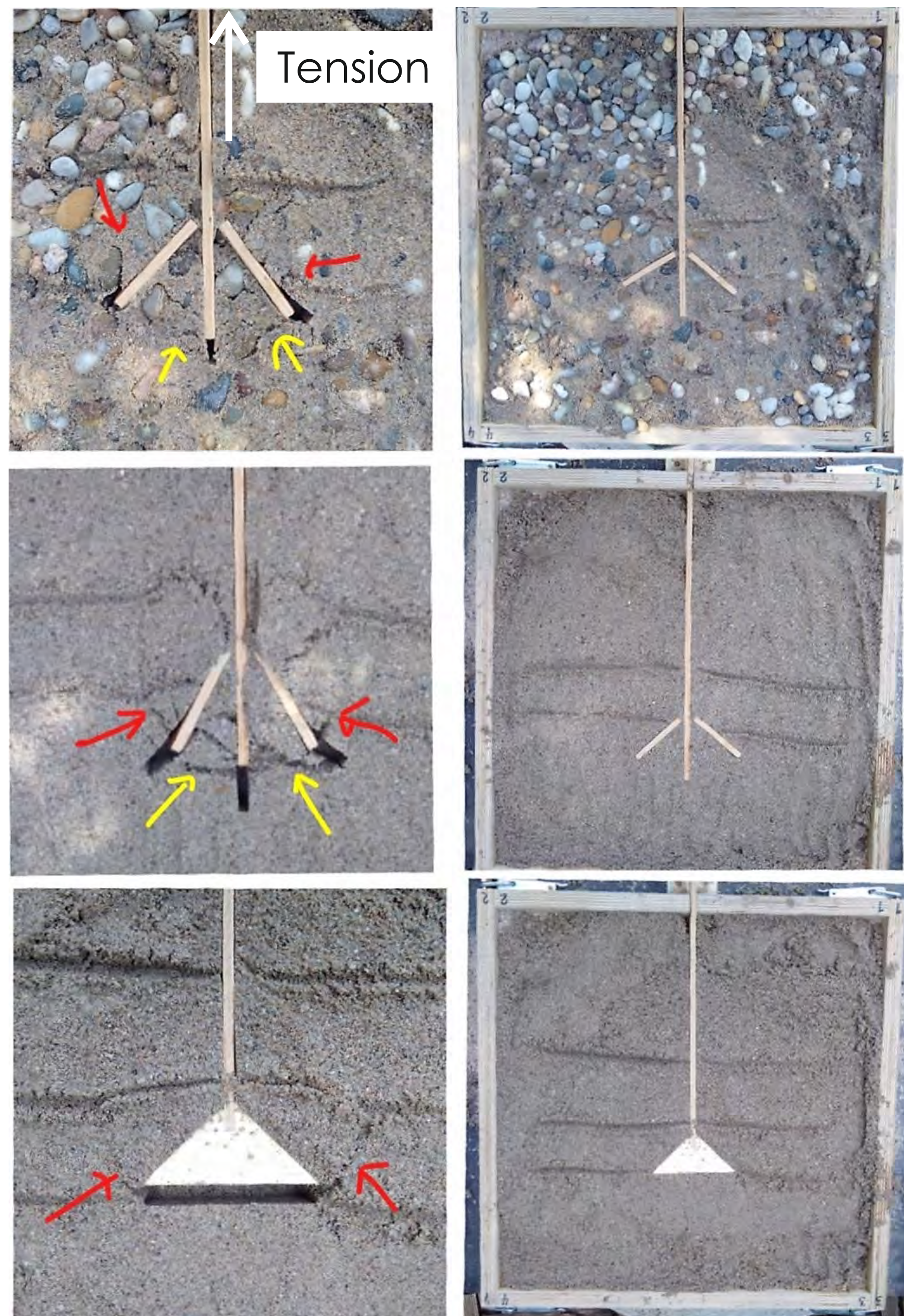
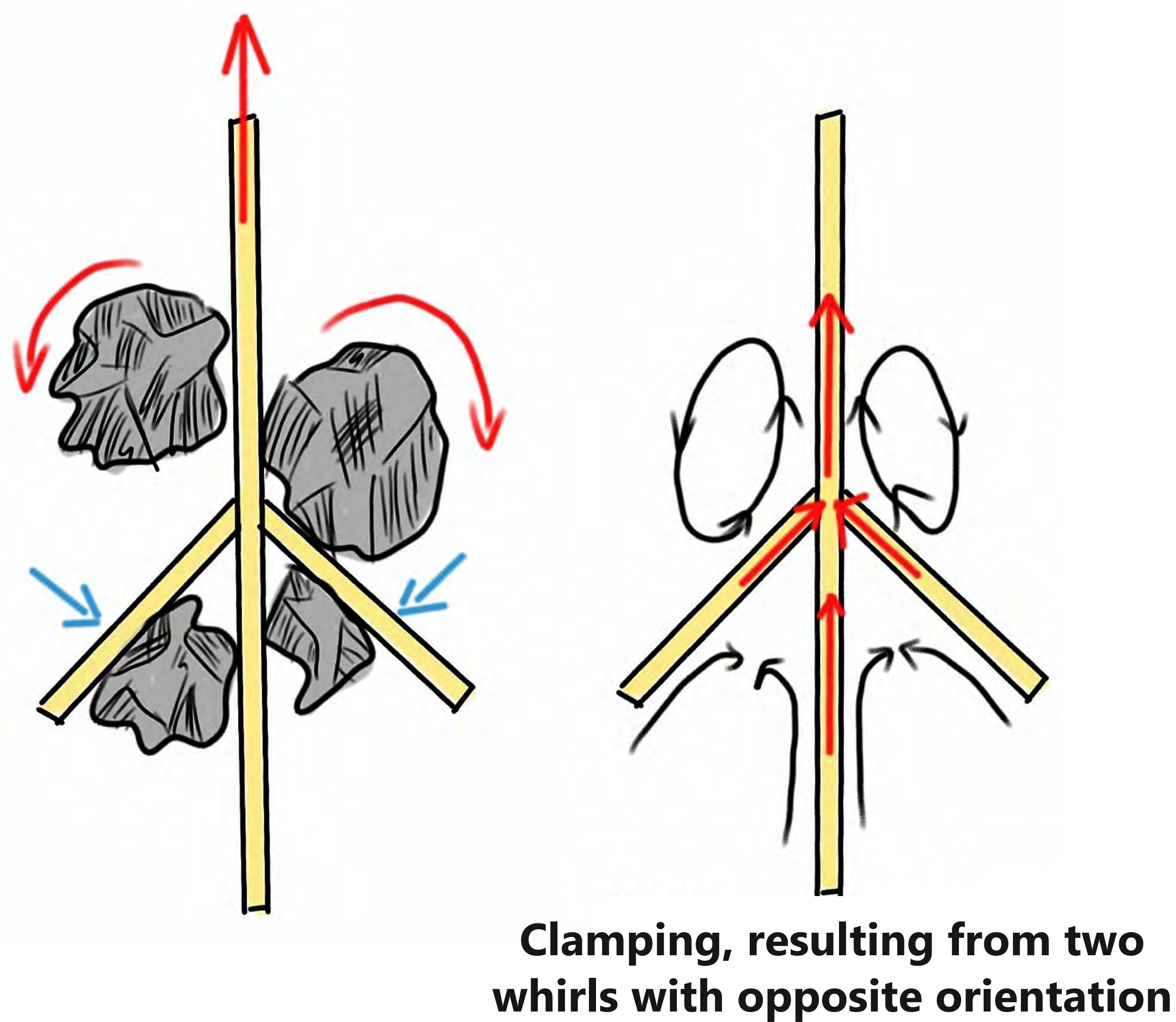
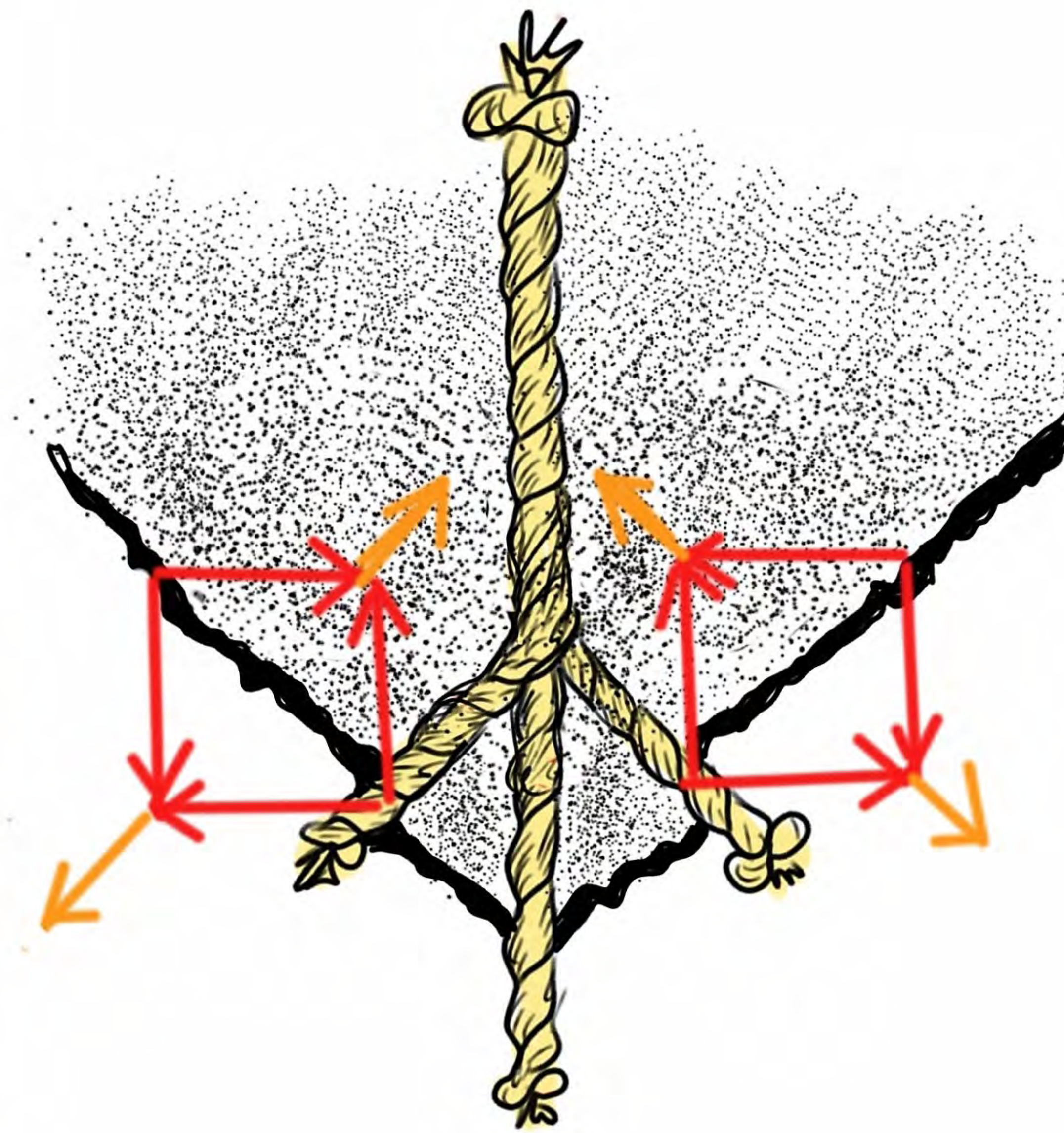


The root branch in the whirl bed

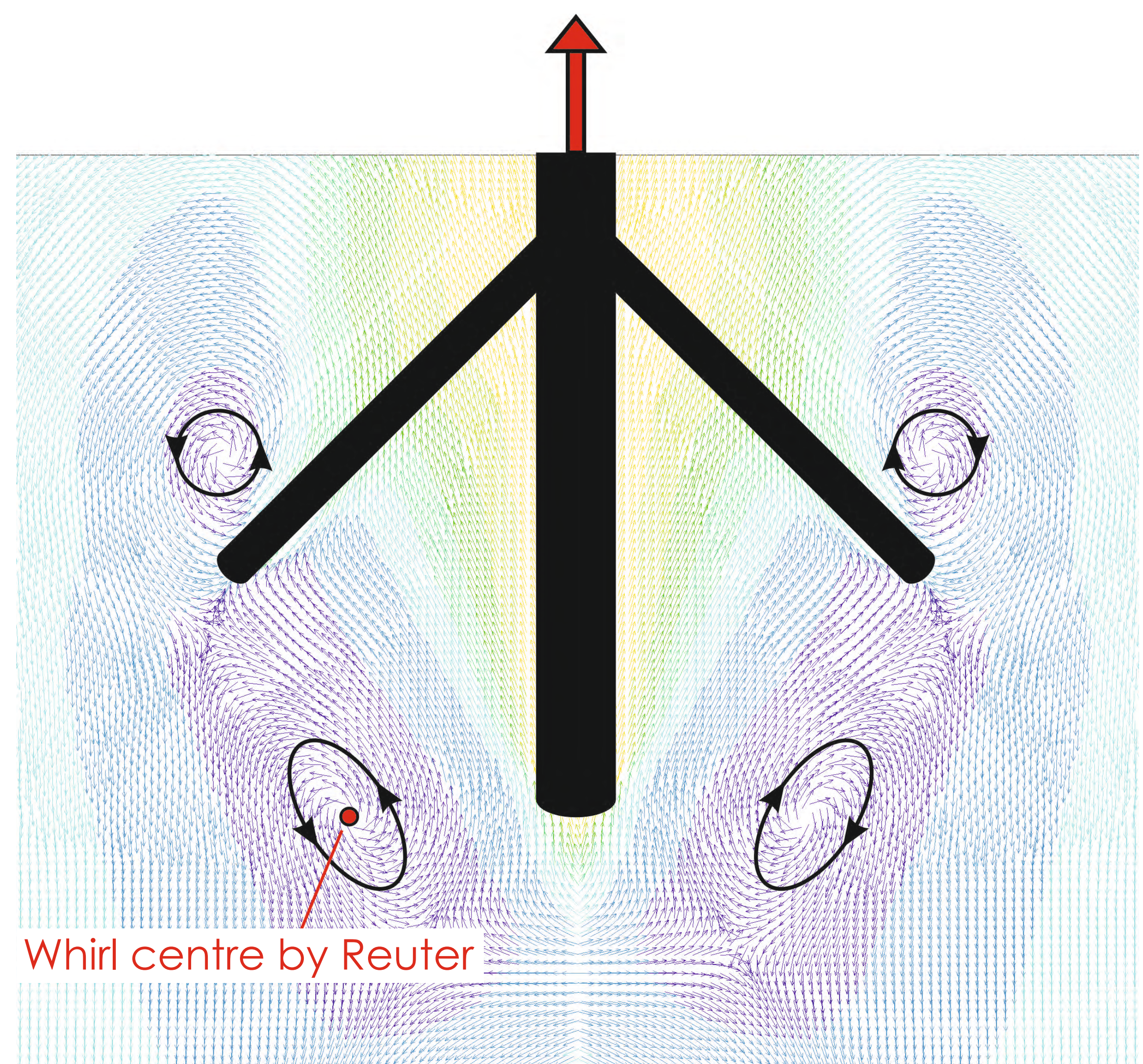
C. Mattheck, K. Bethge, K. Weber, I. Tesari



Pull out tests on root anchor models



Plausibility for whirls at root branches



Finite element calculation as proof of whirl formation

Summary: Pull out of root branches occurs in three phases: 1. Plastic whirls, 2. Rupture of the clamped soil from unclamped soil, 3. Shearing out of the compression cone.