During an earthquake, the seismic rupture propagates from the depth up to the earth surface generating surface ruptures and deformations. The surface rupture observations of earthquake reveals some complexities. These complexities may be related to several physical parameters of the rupture, such as the fault geometry, the deeper fault characteristics, the underground nature, etc.
We use dynamic rupture modeling to investigate surface rupture associated to the earthquake. The simulations are performed using a 3D Fortran code based on Boundary Integral Equations to calculate the spontaneous rupture propagation along a fault embedded in a homogeneous medium in a half space. In a first step of our work, we verified the calculation code using the Southern California Earthquake Center (SCEC) spontaneous earthquake rupture code verification exercice. According to the simulation results of the SCEC application, the code works correctly and can be used to study earthquake dynamic rupture propagation on complicated cases. Then, we studied the Mw 4.9 November 2019 Le Teil earthquake rupture in order to numerically quantify the surface rupture associated to this earthquake. We perform two kind of rupture propagation models : kinematic models and dynamic models to understand the physical mechanisms underlying the observed surface rupture complexities. Le Teil earthquake kinematic modeling results allows us to set physical parameters that control spontaneous rupture propagation which are difficult to measure. The information retrieved from kinematic modeling are used to perform ‘physic-based’ earthquake models. To validate our models, we used the surface ruptures and deformation data derived from correlation of optical satellite images. These surface rupture data are used to generate surface deformation profiles and compare them with numerical results. Our result will be displayed and discussed.