Earthquake potential of the Meishan fault, Taiwan

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We analyzed 206 campaign-surveyed and 57 continuously-recorded GPS data and 315 leveling benchmarks in 2002-2013 to comprehend the earthquake potential of the Meishan fault in SW Taiwan, which is the surface rupture of the 1906 M_H 7.1 Meishan destructive earthquake. The 13.5 km long and 10 km wide E-W-striking Meishan dextral strike-slip fault has been an enigma because its rupture area is only capable to generate a M_w 6.2 earthquake. The westward or eastward extensions of the fault were demonstrated in this study by analyses of the horizontal and vertical velocity fields relative to the S01R station. The horizontal velocity field in this region gradually decreases from 32.0 mm/yr, azimuth 278° in the east to 1.7 mm/yr, azimuth 297° in the west. Three velocity profiles perpendicular to the strike of the Meishan fault are selected in this study from the location of the Meishan fault in the east to its westward extension in the west. A 9.8 mm/yr dextral velocity difference is shown in fault-parallel component across the fault at the easternmost 32 km long profile A. About 8.1 mm/yr dextral velocity difference is represented across the 15 km long westward extension of the fault at the middle profile B. No significant velocity difference is detected at the westernmost profile C in the coastal area. We therefore proposed that the Meishan fault extends westward approximately 15 km, indicating the reactivation of the pre-existing normal fault. A 2D dislocation model is adopted to show the dip range of the Meishan fault is 45°-80° and its depth is 7-11 km. Based on the fault geometry inferred from 2D model, a 3D baseline inversion model is then used to invert the elongation rate on the baselines for estimating the backslip rates on the faults. A preliminary modeling results indicate that the backslip rate up to 24 mm/yr on the Meishan fault, which is much larger than the geological slip rate of 2.5 mm/yr. We are going to establish a more detailed model and a resolution test will be done soon. An earthquake potential will be estimated for the next step.