# 3-D Velocity Model Building in Taiwan Region

Meiling Chen[1], How-Wei Chen[1], Andrew Tien-Shun Lin[1], Hsiao-Lan Wang[2], Yung-En Yu[1] and Kun-Sung Li[2]

[1]Institute of Geophysics, National Central University

[2]Institute of Seismology, National Chung Cheng University

## Abstract

In the past 10 year, there has been several published velocity models (Kim et al., 2005; Ma et al., 1996; Rau & Wu, 1995) proposed to describe the velocity structure beneath Taiwan. These models used generalized linear tomography inversion from earthquake records to construct low resolution, smoothly varying 3D velocity structure. However, the estimated near-surface 3D velocity perturbation within 5 km in depth posed several potential problems: (1) the derived velocity at surface are in general much higher than the measured sediment velocity from borehole and seismic data, (2) long wavelength variation of 3D velocity field do not provide high resolution reflecting surface for more precise wave field simulation and processing, (3) for strong topography and lateral velocity structure changes, particularly at the region with ongoing mountain building processes in Taiwan, the source and receiver static effects becomes obviously important. To incorporate more realistic subsurface geological information, this paper presents our works on integrating near-surface sediment velocity structure with those published velocity models.

Chen (2006) used borehole and seismic data to compute a 3-D sediment velocity structure in the Taiwan Strait and the coastal plain in west Taiwan by using $V_0$-k method. The $V_0$-k method assumes that velocity increases with increasing depth in a linear form $V_Z=V_0+kZ$, in which $V_0$ is the initial velocity at the seabed or on the ground surface, and k represents the rate of increase of the velocity with increasing depth. Fitting velocity with depth through a linear form for each data set from deep drilling boreholes, seismic check-shot or stacking velocity datasets, we obtains $V_0$ (intercept) and k (slope) pairs at each control points through out entire Taiwan. Through careful construction of spatial distribution of $V_0$ and k, we have constructed a more reliable near-surface 3-D velocity structure down to 4 km in depth.

We combined the most updated and appear to be more realistic near-surface model with Kim's tomography velocity model. We will continue our work to incorporate with Wu's model (2006). In view of the reconstructed velocity model, the iso-velocity contours outlined the geometry of the basement structure, especially in the Taiwan Strait and the coastal plain in western Taiwan. The 3D model shows more reasonable sedimentary structure features particularly at shallow depth (< 5 km)

covering whole Taiwan region. Travel-time computations, velocity structure features and sedimentary structure and basin geometries will be presented in this talk. In the future, we will further use offshore wide-angle seismic velocity profiles to incorporate all existing velocity structures and provide a better constrains on preserving the major subsurface geological architecture and 3D velocity field in and around the Taiwan region.

Keywords: 3D velocity, sedimentary basin, shallow velocity profile, borehole, check-shot, seismic stacking velocity, Taiwan.