Overview
We present azimuthally anisotropic fundamental mode Rayleigh wave phase velocity maps as well as the phase velocity and anisotropy inversions for the Mexico area. This region is especially interesting to study because it contains both steep and flat subduction and a volcanic arc that is oblique to the trench. Isotropic and anisotropic 3D velocity structure is needed to infer strain associated with the development of the tectonics. Most shear wave splitting analysis performed in subduction zones display a fast direction of propagation for seismic waves oriented parallel to the trench near the trench, and trench-perpendicular in the backarc. The Mexico subduction zone, however, is an exception to this rule: shear wave splitting analysis performed in that region shows fast directions that are perpendicular to the trench with no significant difference between measurements made above the slab and in the backarc.

Approach
In this study, we analyzed data recorded at 165 temporary and permanent broadband stations installed in Mexico and Southern USA over a period of one and a half years for teleseismic events of magnitude 6.0 and above. We employed a two-station method to measure phase velocity dispersion curves between periods of 16 s to 170 s, using events located within 3 degrees of the great circle path between each pair of stations. We then inverted the measurements to obtain azimuthally anisotropic phase velocity maps and from them got velocity and anisotropy model of the upper mantle.

Accomplishments
Our results revealed lateral variations in phase velocities at all periods consistent with the presence of a flat subduction.

We found phase velocities larger than average in the forearc, and lower than average near the Trans Mexican Volcanic Belt. At short periods (16-33 s), we found strong lateral variations in phase velocities and anisotropy. These are rather complex, and may reflect changes in crustal structure and deformation history. However, at periods of 38 s and higher, the phase velocity anomalies are smoother, with a transition between faster and slower than average phase velocities that follows the shape of the slab depth lines, both in the flat and in the steeper portions of the slab. This enabled us to further constrain the three-dimensional shape of the slab by inverting the dispersion curves and discover a complex structure of the subducting slab (Fig.1).

Our results also revealed variations in Vs velocities (Fig.2) and the anisotropy obtained by inversion for a layering structure separating the crust and the lithosphere.

The study of anisotropy detects different fast directions at different periods in the north part of the study area. This complex pattern could be the signature of a locally modified flow field around the edges of the slab. To the west of the MASE transect, the fast directions are perpendicular to the trench. This may be explained by the alignment of dry olivine due to plate motion. The fast propagation directions east of MASE are parallel to the trench, which may
correspond to trench-parallel flow induced by toroidal flow around the slab. Such directions could also be the signature of wet olivine near the slab. The fast direction interpretation strongly depends on the water and partial melt content which is currently uncertain.

**Future Directions**

Our future research will be directed towards interpreting the results we have obtained so far and combining them with the SKS splitting results to better explain the mantle dynamics near the slab. We also would like to include the tectonic history and the current tectonic velocities which may especially help explaining the anisotropic results.

Fig.2. Phase velocity inversion results and the layering. It easy to identify the slow crust (top 40 km depth) and the separate slab signatures in the lithosphere at 30-90 km depth (blue color). The faster velocity between the slabs may be interpreted as a mantle flow induced by the slab’s roll-back.