9/1/21 – 9/2/21 8 pm, 8 am, noon

Attendees: Sarah Stamps, Xu Rui, Charles Williams

* 200x200 km ??
* Topography change is 2000-3000 m in Daliangshan region.
* Material property changes too.
* Rui wants to investigate how the lateral variations in material affects the inversion  of GNSS data.
* CW works with Laura Wallace (say hi to Laura for me Charles! -Sarah)
* He published with Laura in 2015 using DEFNODE.
* More recently he’s been working with Laura to do an intersiemis locking mode for New Zealand. Doing a locking model. Interseismic deformation.
* He gave us a bunch of scripts from different projects.
* The main one does the integration to go from Pylith Green’s functions to TDENODE greens functions. Py2Def.py (main one).
* He does entire subdiction zone. Finds how to discretize into large quadralaterals. Forms basemesh. Then makes finer mesh using Trelis or cubit at a higher resolution to integrate in there. He helped Rob with this so that it works similar to finite elements. CW replaces tiny elements with triangles.
* Steps are how -
* How many faults? 4

Diagram

Description automatically generated

* Rui cares about the 2 green faults and the brown one to the east. Also the yellow one in the south. In total, 4 faults to take into account. Brown one is a thrust fault. Not well known dip. Yellow one is SS. ~90 degree dip.
* Rui’s in charge of the GNSS network in Sichuan province.
* After 2010, he deployed about 40 GNSS sites in this region.

Map

Description automatically generated

* More than 100 GNSS sites in this region including other groups.
* He wants to take more information into account, like the material heterogeneity.
* Have we put together a TDEFNODE model for the area? Yes.

Graphical user interface, application

Description automatically generated

* CW decide to only include the subduction zone in NZ. But he did put together the ones for the surface faults. He probably didn’t give us everything we need. Look into meshing

Graphical user interface, table

Description automatically generated with medium confidence

Graphical user interface, text, application

Description automatically generated

* This one reads .nod command to create a geometry. Creates a Trelis file.
* You create a journal file. You can read them a play them in Trelis. This code reads in a configuration file and creates the meshing commands that you need. Within Trelis you can create surfaces that you then export and use them later however you want. Then you can read them back in a mesh them.
* Charles writes a lot of Python scripts.
* Pyre.inventory.
* Pyre is used by PyLith. It’s a package that does unit conversions. It can read the configuration field. It’s a top level way of keeping track of how you are controlling your problem.
* Associated with python is a .cfg file. Same name with .cfg.

Graphical user interface, application, Word

Description automatically generated

* CW gets these from Laura.
* CW considering doing a tutorial on how to do this.
* We’ll need Python 2
* If you install the binary of Pylith, it shooudl have most of the packages needed to use these scripts. Need fortranformat. DeFNODE and TDENODE have Fortran things in their files.
* He goes into DEFNODe to get the format string and reads it into Python
* The files needed, are .nod files, greens functions files. CW fixed that.
* CW is wondering….
* We need multiple meshes.
* Should have a separate mesh for each fault.
* .nod file that goes with each.
* Make a mesh for each fault.
* CW suggest Rui sends him .nod files.
* CW will put together, including a readme, of what Rui should do to create the faults.
* Rui needs to send him the .nod files for the different faults. CW can put together a sample directory of how to make the  mesh.
* You create the mesh and you want good mesh resolution where your observations are.
* If you had course mesh resolution where the stations are far apart in the NW, you’ll get an answer, but you would interpolate over a coarser mesh than what you want. Keep this region:

Diagram

Description automatically generated

* Fine mesh around faults, coarse outwards. CW defines an ellipse in his interesting region and grades coarser away from the ellipse.
* CW will put together a recipe. Including a recipe with the python scripts.
* CW has lists of sites from different sources that merge them together.
* Rui needs to send .nod files and CW will send a directory
* All observations are GNSS.
* Do we have a Vp, Vs. and density model for the region? Yes.
* We need to make sure it’s going to be an important effect for where we are.
* If there aren’t significant gradients in the properties.
* 2018 paper. Goes into importance of gradients in the materials properties.
* Williams and Wallace 2018 GRL.
* Meet every 3 weeks. Next Sept. 22/23 same time.
* Faults go about 20 km deep. What meshing needed on the fault? Like every 5 km? Yes, if that’s easy to do. Is that uniform along strike? Along strike is coarser than along depth.
* Check out the videos and tutorials for Pylith from the link below
* CW suggests to try examples 3D Hex8. It’s a box with a fault in it. Best place to start.
* CW - there are videos and presentations of some old tutorials. <https://geodynamics.org/cig/working-groups/short-term-crustal-dynamics/past-workshops/>

Action items

* RX to send .nod files for DS region to CW (cc Sarah)
* CW to make readme based on his .nod files.
* RX to review PyLith manual and go through 3D hex8 example
* Meet in 3 weeks.