Exercises for GDA - Intro + data
Solutions

1. There was this great shallow Mw 7.8 event in Nepal in April 2015. You want to explore the differences in arrival times of a station close-by and a far station.
    a. What do you need to find out first to be able to look for data?
    b. Get the data of some phases of a close-by (e.g. < 10°) and a far station (e.g. ~60°). What are the differences, can you already explain them?

    Solution:
    a. Date, UTC time, coordinates, etc. -> e.g. USGS significant EQ archive: 2015-04-25 06:11:25 UTC, 28.230°N 84.731°E, 8.2km, …
    b. several options: again USGS significant EQ archive (phases directly, if you know which station is near and far) or IRIS metadata aggegator (check out available stations) or IRIS Wilbur (check out available stations & immediately get phase information)
    e.g. IC.LSA (near) and IU.GRFO (far)

2. You think about planning a new seismotectonic project in Mongolia based on earthquake analysis and earthquake mechanisms. What do you need to find out to see if this project would be possible? Do it.

    Solution:
    a. Does Mongolia has a national station network and are the data freely available? IRIS metadata aggegator; yes: code XL, 74 stations, but no real-time, only archive until 2014 (partially restricted)
    b. Are there moment tensors available (42-52N and 87-121E)? GCMT catalogue: 72 mechanisms since 1979, 14 mechanisms sinse 2012 (archive start on XL network)
    c. literature research …

3. GERMAN: You want to know if there have been earthquakes with magnitude M>3.5 within Germany and closest surrounding since 2014. Go figure it out!

    Solution:
    BGR -> Erdbebenauswertung -> Deutschland seit 1968; 6 events (Vogtland, Darmstadt and Austria)
    http://www.bgr.bund.de/DE/Themen/Erdbeben-Gefaehrdungsanalysen/Seismologie/Seismologie/Erdbebenauswertung/D_seit_1968/d_1968_node.html
    or http://www.szgrf.bgr.de/ → preliminary list of stronger seismic events in Germany since 1994

4. List the events with magnitude > 6.5 that happened since 1.1.2015, with a depth greater than 500 km. What do the moment tensors/beachballs of these events look like? Can you explain why?

Solution: several possibilities, but GCMT catalog dialog allows to select all these criteria and returns beachballs. Mostly thrust/normal compression type events, because subduction.

5. You want to use regional recordings of the Mw7.2 event that occurred on 28.06.1992 in California. Find out which seismic stations are located within 1 degree of the event, and were recording during the earthquake. Can you export a list or a map with the stations?
   Solution: find out which event this is (Landers) using IRIS interactive earthquake browser http://ds.iris.edu/ieb/. Find stations within 0.5 degree centered on lat / lon of event (34.25; -116.48) using IRIS SeismiQuery "stations" (with option for map)

6. You want to perform body wave tomography of southern Finland. Find out if there is an array of stations. How many magnitude > 5.5 earthquakes happened globally during the time the array was deployed?
   Solution: Map of EIDA stations via orfeus shows a nice temporary array covering Finland. It was deployed approximately from 30.09.1998 to 01.03.1999. http://www.orfeus-eu.org/eida/eida.html for first look; Webdc3 for exact list of stations Searching with IRIS earthquake browser shows approx 100 events Mw>5.5 (will depend on the exact dates chosen).

7. You want to have a look on the magnetic field variations on 24.04.2016 at the station in Fürstenfeldbruck. Get the data.
   Solution: Data download at www.intermagnet.org, page is pretty much self-explaining

8. GERMAN: For your studies you need to know the exact coordinates and reference gravity value of the Munich reference point of the German Gravity Network. Find them!
   Solution: on http://www.bkg.bund.de/nn_149572/EN/FederalOffice/Geodesy/RefSys/NatRefGrav/Grav03__node.html__nnn=true is a pdf for download. Check out for Munich.

9. You are performing a local study of the Mount Etna region in Sicily. You would like to add data from deep earthquakes. Try the website http://ds.iris.edu/ieb/ (hint, there is already a topic for deep earthquakes in Italy). You need to know what depth range is available in the local area. Can you explain the pattern of seismicity? Why are the earthquakes so deep?
   Solution: The website shows earthquakes from 70 km to deeper than 500 km. The shallowest earthquakes are northwest of the Calabrian Arc and the deepest earthquakes are in the Tyrrhenian Sea. The African Plate is subducting from a position south east of the Calabrian Arc (the plate boundary is marked on the map) underneath the Calabrian Arc.