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Scientific Notebook #177 on
Radionuclide Transport KTI

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20-5708-871

KTI on Radionuclide Transport

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DRJ David R. Turner - Sr. Research Scientist (CNWRA)

ah April M. Hobb - Student Scientist

Objectives (20-5708-871) - KTI on Radionuclide Transport

The purpose of the research discussed in this scientific notebook is to evaluate available geochemical, geological, and hydrologic data in the vicinity of Yucca Mountain. These data will be used to help delineate regional flow patterns and constrain the potential for dilution of radionuclide-bearing waters through mixing between different bodies of groundwater. These data will be evaluated by developing geographic information system (GIS) coverages specific to hydrologic flow and transport. The data used in constructing the GIS coverages are largely pre-existing data acquired and/or compiled by the DOE and its contractors (e.g., USGS). Therefore, one of the main objectives of this scientific notebook is to document data sources and data quality (where possible).

May 24, 1996

Initial Entry 1/17/97

The data was taken from the database Dataedit.xls from:

Perfect, D. et al, 1995, Hydrochemical Database for the Death Valley Region, California and Nevada; U.S. Geological Survey Open File Report.

May 24, 1996

-opened in Excel the file Dataedit.xls
-I sorted the information to find all of the well sites that were balanced
-I deleted all of the unbalanced well information
-the balanced wells were saved as balanced.xls in Excel
-I then sorted the information with respect to names of the well sites and then the date that the data was obtained in ascending order in the file balanced.xls
-I then eliminated all of the data that weren't the most recent and complete for the major ions each well site
-this ideally leaves one set of recent data for each well site
-this new data set is named edbalanc.xls in Excel

April Hoh
ah ~~April~~ May 24, 1996

April Hoh

May ~~28~~ 27, 1996 ah

Procedure for May 27, 1996

Converted edbalanc.xls to edbalanc.csv (a comma delimited file) in order for Arcview to open the file. In Arcview the file was then changed to edbalanc.shp in order to create a theme (a map display of the data). Edbalanc.shp is a map that plots the sites of the wells that geochemical information has been obtained from. Edbalanc.shp will be useful in looking for geochemical trends in the surrounding watersheds.

Toposite.apr, a project in Arcview was created. Toposite.apr combines the topographic maps, the outline of Nevada (nvbndshp.shp) and its counties, and edbalanc.shp-- the well sites. The topographic maps are found in the files w118n35.shp, w117n35.shp, w116n35.shp, w118n36.shp, w117n36.shp, w116n36.shp, w118n37.shp, w117n37.shp, w116n37.shp.

The completed project shows the topographic map of the repository area--Southern Nevada and California.

April Hoh
May 27, 1996

April Hoh

May 28, 1996

Procedure for May 28, 1996

Called up the file frizgeo.shp. This is a file containing the geologic map by V.A. Frizzell and J. Shulters of the area surrounding the repository and the Nevada Test Site. I queried the file in order to divide the map into geologic units by their age. The final map is saved under frizgeo.apr.

April Hok
May 28, 1996

April Hok

May 30, 1996

Procedure for May 30, 1996

Added activity of Calcium to the file edbalanc.xls to see the concentration of Calcium in the wells. This was saved as a new file edbalref.xls. Edbalref.xls was then saved as a comma delimited file as edbalref.csv in order to be opened in Arcview. In Arcview, the file ~~edbalref~~ edbalref.csv became edbalref.shp in order to be plotted as a map. The purpose of the file edbalref.shp is to see the trends in Calcium concentration in order to determine where and if watersheds mix.

5/30/96

April Hok
May 31, 1996

April Hok

June 4, 1996

Procedure for June 4, 1996

I queried the frizgeo.shp file in order to map the aquifers and aquitards as defined by Winograd and Thordarson (1975). The query was defined by the unit names that are found within each aquitard and aquifer. The purpose of dividing the units is to determine in which aquifer or aquitard the wells in the edbalanc.shp file are found. This will aid in further geochemical analysis, as different geologic units will produce different chemistrys. Ultimately, the geochemical analysis will prove useful in mapping interbasin water movement.

April Hoh

April Hoh
June 4, 1996

June 7, 1996

Procedure for June 7, 1996

I queried the file edbalanc.shp in order to include only the sites that plotted in the area covered in the frizgeo.shp file. This file was saved as 2.shp then renamed to frizsite.shp.

The file 2.shp, or frizsite.shp, was then queried to group the different wells into the aquifer and aquitard classification that is defined by Winograd and Thordarson (1975). The aquifers found were the valley fill aquifer, perched aquifers in the tuff aquitard, tuff aquitard, lower carbonate aquifer, lower clastic aquitard, welded tuff aquifer. I defined the different aquifers and aquitards in the well sites by using the following papers: Winograd and Thordarson (1975), White (1979), and Shoff and Moore (1964).

April Hoh
June 7, 1996

ah 6/7/96

Bibliography

Shoff, S.L., and Moore, J.E., 1964, Chemistry and movement of ground water, Nevada Test Site: U.S. Geological Survey Trace-Elements Investigation Report 838, 75 p. (NNA.870518.0062)

Winograd, I.J., and Thordarson, W., 1975, Hydrologic and hydrochemical framework, south-central Great Basin, Nevada-California, with special reference to the Nevada Test Site: U.S. Geological Survey Professional Paper 712-C, p. C1-C126. (NNA.87046.0201)

White, A.F., 1979, Geochemistry of ground water associated with tuffaceous rocks, OasisValley, Nevada: U.S. Geological Survey Professional Paper 712-E, p. E1-E25. (NNA.870517.0034)

April Hoh

Procedure for June 19, 1996

Procedure for June 19, 1996

I made a new Frizzell and Shulter's map due to the incorrect unit assignments made in the previous map. The new map is the frizgeo2.apr project in ArcView. This new map was created by editing the dbf file (the database or attribute table) for the frizgeo.shp file. Two new columns or fields were added. Geo_period is a new column containing the geologic time period that each unit is formed in, and aquifer is a new column containing the aquifer that each unit is found in according to Winograd and Thordarson (1975). These new columns aided in the classification of the frizgeo.shp into geologic units and their respective aquifers by using the "CLASSIFY" command in the legend editor for the geo_period and aquifer columns.

April Hoh, June 19, 1996

June 26, 1996

Procedure for June 26, 1996

I took the new file dataed2.xls containing the isotope data and eliminated all wells that didn't have isotope data listed and weren't balanced. I then further slimed down the database by eliminating all wells that had duplicate information. The final sheet has information for 95 well sites. To this sheet, I added the activities of calcium and carbonate, and the ratio of the activity of calcium to the activity of hydrogen. This final database is dataed3.xls.

Bibliography for the Isotope data that was added to dataedit.xls.

Benson, L., Robison, J., Blankennagel, R., and Ogard, A., 1983, Chemical composition of ground water and the locations of permeable zones in the Yucca Mountain area, Nevada: U.S.G.S. Open File Report 83-854, 19 p.

Benson, L., and McKinley, P., 1985, Chemical composition of ground water in the Yucca Mountain area, Nevada, 1971-84: U.S.G.S. Open File Report 85-484, 10 p.

Claassen, H., 1985, Sources and mechanisms of recharge for groundwater in the West-Central Amargosa Desert, Nevada-a geochemical interpretation: U.S.G.S. Professional Paper 712-F, F1-F31.

Lyles, B., Edkins, J., Jacobson, R., and Hess, J., 1990, Time-series analysis of ion and isotope geochemistry of selected springs of the Nevada Test Site, Nye County, Nevada: Desert Research Institute, Water Resources Center, Pub. No. 45068, 121 p.

Lyles, B. and Hess, J., 1988, Isotope and ion geochemistry in the vicinity of the Las Vegas Valley shear zone: Desert Research Institute, Water Resources Center, Pub. No. 41111, 78 p.

Ludwig, K. R., Peterman, Z., Simmons, K, and Gutentag, E., 1993, 234U/238U as a ground-water tracer, SW Nevada-SE California: High Level Radioactive Waste Management, Proceedings of the Second Annual International Conference, Las Vegas, Nevada, April 26-30, 1993: La Grange Park, Ill., American Nuclear Society, p. 1567-1572.

Stuckless, J., Whelan, J., and Steinkampf, W. C., 1991, Isotopic discontinuities in ground water beneath Yucca Mountain, Nevada: High Level Radioactive Waste Management, Proceedings of the Second Annual International Conference, Las Vegas, Nevada, April 28 - May 3, 1991: La Grange Park, Ill., American Nuclear Society, p.1410-1415.

Waddell, R.K. 1982, Two-dimensinal, steady-state model of ground-water flow, Nevada Test Site and vicinity, Nevada-California, U.S.G.S. Water Investigations Report 81-4085, 71 p.

White, A. and Chuma, N., 1987, Carbon and isotopic mass balance models of Oasis Valley--Fortymile Canyon groundwater basin, Southern Nevada: Water Resources Resource, v. 23, n. 4 p.571-582.

Winograd,I.J. and Pearson,F.J. 1976, Major carbon 14 anomaly in a regional carbonate aquifer: possible evidence for megascale channeling, South Central Great Basin: Water Resources Research, v. 12, no. 6, p. 1125-1143.

Winograd, I.J. and Friedman, I. 1972, Deuterium as a tracer of regional ground-water flow, Southern Great Basin, Nevada and California: Geological Society of America Bulletin, v.83, p. 3691-3708.

June 28, 1996 - July 2, 1996

April Hall July 2, 1996

Procedure for Subbasins workspace in ARC/Info
(June 28, 1996 - July 2, 1996)

I digitized figure 4 from Sadler (1992) which illustrates Sadler et.al.'s interpretation of the basins and subbasins within the Nevada Test Site and surrounding vicinity. The final coverage is title sad92utm and is in the subbasins workspace in my home directory. The projection of sad92utm is in utm, zone 11 in order to be in the same projection as the band5.bil image that the basins will be overlaid on.

Plate 1 from the Czarnecki (1985) paper is also digitized and found in the subbasins workspace. Plate 1 illustrates Czarnecki's interpretation of the basins and subbasins in the NTS area. The file digitized ARC/Info file is called czar85utm and is projected in utm, zone 11.

The Feeney (1987) map of basins and subbasins is digitized from figure 5. DSC Model Network and . The final file is called fee87utm and is projected in utm, zone 11.

ah 7/2/96

Bibliography for Subbasins Coverages

Czarnecki, J.B. and Waddel, R.K., 1984, Map showing measured hydraulic heads, model residuals, model zones, model finite`element mesh, and section showing generalized geology Yucca Mountain and vicinity, Nevada`California: U.S.G.S. Water Investigations Report 84`4349.

Feeney, T., Campana, M., and Jacobson, R., 1987, A deuterium`calibrated groundwater flow model of the Western Nevada Test Site and vicinity: Water Resources Research, pub. no. 45057.

Sadler, W., Campana, M., Jacobson, R., Ingraham, and N., 1992, A deuterium`calibrated, discrete`state compartment model of regional groundwater flow, Nevada Test Site and vicinity: Water Resources Center, pub. no. 45088.

July 3, 1996 - July 5, 1996

April Hall July 5, 1996

Procedure for July 3, 1996 to July 5, 1996

I completed Sid Jones's combining the Frizzell and Shulters map with the Monsen map of Bare Mountain in ARC/Info. It appears that Sid had used the Monsen map that was digitized by Kathy Spivey and combined that with the Frizzell and Shulters map provided by the USGS. This initial map was then put through a CLEAN operation in ARC/Info which makes all closed arcs into polygons. The CLEAN operation created a problem area in the overlapped region by creating unnecessary polygons that took on the attributes of the polygons closest to them. This created some problems with false units in the overlapped region. I deleted all of the unnecessary polygons using the Frizzel and Shulters map as my base map.
In addition to the unnecessary polygons, no one had yet reassigned the map units of the Monsen map to match those in the Frizzell and Shulters map. Dave Turner and I reassigned the Monsen units to best fit the Frizzell and Shulters map. This key is posted in this notebook.
After I reassigned the Monsen units, I edited the coverage so that all polygons were closed and then applied the CLEAN command to create a polygon coverage. This final map is called friz_mons and is in my baremtn workspace.
Finally, I converted the friz_mons map into a shapefile for manipulation in ArcView. This shapefile is under the 'april' directory on the g: drive and is called frizmons.shp.

ah 7/5/96

Bibiliography

Frizzell, V. and Shulters, J., (1990) Geologic map of the Nevada Test Site, Southern Nevada USGS Map I-2046.

Monsen, S., Carr, M., Reheis, M., and Orkild, P., (1992) Geologic map of Bare Mountain, Nye County, Nevada: USGS Map I-2201.

1/9/97 DRJ

Notebook closed due to closing of Radionuclide Transport KTI (20-5708-871). Final deliverables transmitted to NRC

I have reviewed this notebook and find it in general compliance with QAP-011. There is adequate information for another qualified person to conduct the activities.

E.C. [illegible]
1/13/97