1-2014

GEO 585.02: Groundwater Surface-Water Interaction - A Multi-Disciplinary Approach

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Geo 585-02

Spring 2014

Surface-water Groundwater Interaction: A Multi-Disciplinary Approach

Woessner
Tues-Thur8:10-9:00 + Three required 1/2 day field trips, I would consider a change in time or 2 hr on one day for lecture.
Dr. Woessner's speaking and meeting schedule this semester will require rescheduling class meetings to a 2 hr evening meeting occasionally. A weeks notice will be given for any changes in the course meeting schedule.
Text: Readings on MOODLE

Course Objectives:
To explore the tools and methods used to study groundwater and surface water interaction in lakes, wetlands and streams. Become familiar with the classic and modern literature on surface water groundwater interaction.

Specific Requirements
1. Read and prepare all assigned papers for each class period. Prepare a 5 minute summary class presentation and participate in paper discussions **Purpose and Objectives, Methods, Results and Discussion and Conclusions**..

2. Attend Three ½ day field trips Tentative Schedule is set in the courses outline. However, weather considerations will require some adjustments.

3. Completion of a 10 page term paper on one area of surface water- groundwater quantification or characterization: Physical methods, Geochemical Methods, Biological Methods. Paper **Due May 6.**

Assessment:

1. Satisfactory active class participation by being prepared to present summaries of each assigned article and active participation in discussions. Papers for the class meeting will be assigned and then students will randomly be chosen to present summaries and lead discussions (only three unprepared will be accepted then final grade will be decrease by 5 % for all additional unprepared. B. 80% is a passing grade for this course)
2. Satisfactory participation in scheduled field trips (attend all trips)
3. Grad of B or better on term paper.

Exam Schedule Thursday May 8th in class

January 28
Intro, Course Assignments, Groundwater Basics,

January 30
Groundwater Basics and Water Budget: Readings in Tools MOODLE Sustainability of Groundwater Resources USGS Circular 1186.

Tools

(sign up for times)
How to Read A Science Paper -Rice University. PDF

Winter, T.C., 1981, Uncertainties in Estimating the Water Balance of Lakes, Water Resources Bull 17(1), 82-115.
Precipitation p.85-88_____ Evaporation p.88-95_____

Feb 4
Stream Flow p. 95-98_____Overland flow p. 98-101_____

Groundwater 101-106_____Lake volume 106-108 _____

Feb 6
Implications 108-110_____ Conclusions 110 Bill

Error analysis Taylor 1997 Intro to error analyses Section 3.5_____

Graham, C. B., van Verseveld, W., Barnard, H. R. and McDonnell, J. J. (2010), Estimating the deep seepage component of the hillslope and catchment water balance within a measurement uncertainty framework. Hydrol. Process., 24: 3631–3647. doi: 10.1002/hyp.7788_____

Scott, R.I., 2010, Using watershed water balance to evaluate the accuracy of eddy covariance evaporation measurement for three semiarid ecosystems, Agricultural and forest Meteorology 150, 219-225 pp._____

Feb 11
Maupin, M.A., and Weakland, R.J., 2009, Water budgets for Coeur d'Alene Lake, Idaho, water years 2000–2005: U.S. Geological Survey Scientific Investigations Report 2009-5184, 16 p_____.

Lee, D. R and J. A. Cherry, 1978. A field exercise on groundwater flow using seepage meters and mini-piezometers. Journal of Geological Education, 27, , 6-10_____ and A simple device for measuring differences in hydraulic head between surface water and shallow groundwater, USGS

Shaw, R. D. and E. E. Prepas, 1989. Anomalous, short-term influx of water into seepage meters. Limmol. Oceanogr., 34(7), pp. 1343-1351._____

Feb 13

Murdoch, L. C. and S. E. Kelly, 2003. Factors affecting the performance of conventional seepage meters. WRR 39(6), 1163, doi:10.1029/2002Wroo1347,2003, SWC 2-1-2-10.

Rosenberry, 2005, Integrating seepage heterogeneity with the use of ganged seepage meters. Limnology and Oceanography: Methods ;131-142

Hannula, S. R., K. J. Esposito, J. A. Chermak, D. D.Runnells, D.C. Keith and L. E. Hall, 2003. Estimating ground water discharge by hydrograph separation. Ground Water, 41(3), p. 368-375.

Feb 18

Landon, M. K., D L Rus, and F. E. Harvey, 2002, Camparison of instream methods for measuring hydraulic conductivity in sandy streambeds. Ground Water 39(6), p. 870-885.

LaBaugh, J. W., T. C. Winter and D. O. Rosenberry, P. F. Schuster, M. M. Reddy and G. A. Aiken, 1997. Hydrological and chemical estimates of the water balance of a closed-basin lake in north central Minnesota. WRR, 33(12), pp. 2799-2812.

Johnson, Adam N., Brian R.. Boer, William W. Woessner, Jack A. Stanford, Geoffrey C. Poole, Steven A. Thomas, and Scott J. O'Daniel. 2006. Evaluation of an inexpensive small diameter temperature logger for documenting ground water –river interactions. Ground Water Monitoring and Remediation, Ground Water Monitoring and Remediation. 25, 4:68-74.

Feb 20

Focus on Lake Systems

All students are responsible for all papers at all times. Electronic versions of papers provided in class. Students are expected make a 5 min presentation and hit the important points when called upon. Participation by random draw at the start of each class.

Bill background on GW and Lakes

McBride, M. S. and H. O. Pfannkuch, 1975. The distribution of seepage within lakebeds. Jour. Research USGS, 3(5), pp. 505-512.

Lee, D. R., J. A. Cherry and J. F. Pickens, 1980. Groundwater transport of a salt tracer through a sandy lakebed. Limnol. Oceanogr. 25(1), pp. 45-61.

Anderson, M. P. and J. A. Munter, 1981. Seasonal reversals of groundwater flow around lakes and the relevance to stagnation points and lake budgets. WRR, 17(4), pp. 1139-1150

Feb 25
Winter, T. C., 1978. Numerical simulation of steady state three-dimensional groundwater flow near lakes. WRR, 14(2), pp. 245-254.

Cornett, R. J., B. A Risto and D. R. Lee, 1989. Measuring groundwater transport through lake sediments by advection and diffusion. WRR, 25(8), pp. 1815-1823.

Stauffer, R. E., 1985. Use of solute tracers released by weathering to estimate groundwater inflow to seepage lakes. ES&T, 19, pp. 405-411.

Feb 27
Woessner, W. W. and C. Brick, 1992. The role of groundwater in sustaining shoreline spawning kokanee salmon, Flathead Lake, Montana. First International Conference on Ground Water Ecology, USEPA and AWRA, pp. 257-266.

Rosenberry, D. O., 2000. Unsaturated-zone wedge beneath a large, natural lake. Water Resources Research, Vol. 36, no. 12, pp. 3401-3409.

Focus on Wetlands

Bill background hydrogeology of wetlands

March 4
Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Chapter 2. Definitions of Wetlands.

Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Chapter 3. Wetland types and Wetland Resources of North America Pages 30-53

Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Chapter 4. Hydrology of Wetlands.67-90

March 6
Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Chapter 4. Hydrology of Wetlands.90-113

LaBaugh, J. W., 1986. Wetland ecosystem studies from a hydrologic perspective. Water Res. Bull., 22(1), p. 1-10.

Stevenson, R. J. and F. R. Hauer, 2002. Integrating Hydrogeomorphic and Index of biotic integrity approaches for environmental assessment of wetlands. J. N. Am. Benthol. Soc, 21(3): p. 502-513.

March 11
State of New Jersey, 2002?, Regionalized Water Budget Manual for Compensatory Wet land Mitigation Sites in New Jersey.

Meyboom, P., 1967. Mass-transfer studies to determine the groundwater regime of permanent lakes in hummocky moraine of western Canada. Journ. of Hydrology, 5, pp. 117-142.

Rosenberry, D. O. and T. C. Winter, 1997. Dynamics of water-table fluctuations in an upland between tow prairie-pothole wetlands in North Dakota. J. of Hydrology, 9, p. 266-289.

March 13
Koerselman, W., 1989. Groundwater and surface water hydrology of a small groundwater-fed fen. Wetlands Ecology and Management, 1(1), p. 31-43.

Hensel, B. R. and M. V. Miller, 1991. Effects of wetlands creation on groundwater flow. J. of Hydrology, 126, p. 293-314.

Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. 17. Wetland Creation and Restoration.p. 577-598

March 18
Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Wetland Creation and Restoration.p. 598-615

LaBaugh, J. W., T. C. Winter, G. A Swanson, D. O. Rosenberry, R. D. Nelson and N. H. Euliss, Jr., 1996. Changes in atmospheric circulation patterns affect midcontinent wetlands sensitive to climate. Limnol. Oceanogr., 41(5), p. 864-870.

Focus on Streams

Bill Background on GW and StreamsWoessner, W. W , 2000. Stream and fluvial plain ground-water interactions: re-scaling hydrogeologic thought. Ground Water..

March 20

Sharp, J. M. , 1988, Alluvial aquifers along major rivers, in Bac, W., Rosenshein, J. S. and Seaber, P. R., eds. Hydrogeology: Boulder, CO, GSA, The Geology of North America, O-2 : 273-282.

Hayashi, M. and Rosenberry, D. O., 2002. Effects of groundwater exchange on the hydrology and ecology of surface water. Ground Water, Vol. 40, no. 3, pp. 309-316.

Velett, H. M., Hakenkamp, C. C., and Boulton, A. J., 1993, Perspectives on the hyporheic zone: integrating hydrology and biology, introduction.. J. N. Am. Benthol. Soc. 12: 40-43.

March 25

Triska, F.J., V.C. Kennedy, R.J. Avanzino, G.W. Zellweger, and K.E. Bencala, 1989. Retention and transport of nutrients in a third-order stream in northwestern California: Hyporheic Processes. Ecology, 70(6): 1893-1905.

Alexander, M. and D. Caissie, 2003. Variability and comparision of hyporheic water temperatures and seepage fluxes in a small atlantic salmon stream. Ground Water 41(1): p. 72-82.

Dahm, C. N., Grimm, N. B., Marmonier, P., Valett, H. M., and Vervier, P., 1998, Nutrient dynamics at the interface between surface waters and groundwaters. Freshwater Biology, 40: 427-451.

March 27

Cardenas, M.B. and V. A. Zlotnik, 2003, Three-dimensional model of modern channel bend deposits. WRR 39(6), 1141, doi:10.1029/2002WR0011383.2003; SHB1-1SHB 1-12.

Hoehn, E. and von Gunten, H. R., 1989, Radon in groundwater: a tool to assess infiltration from surface waters to aqufiers. RRR, 25(8): 1795-1803.

Von Gunten, H. R., Karahenbohl, U., Kuslys, M., Giovanoli, R., Hoehn, E., and Keil, R., 1991, Seasonal Biogeochemical cycles in riverborn groundwater. Geochemica et Cosmochemica Acta., 55: 3597-3609

SPRING BREAK March 31 through April 4

April 8

Stanford, J. A., 1998, Rivers in the landscape: introduction to the special issue on riparian and groundwater ecology. Freshwater Biology, 40: 402-406.

Wroblicky, G. J. and Campana, M. E., 1998, Seasonal variation in surface-subsurface water exchange and lateral hyporheic area of two streams. WRR, 43(3): 317-328.

Valett, H. M., Fisher, S. G. and Stanley, E. H., 1990, Physical and chemical characteristics of the hyporheic zone of a Sonoran Desert stream. J. N. Am. Benthol. Soc., 9(3): 201-215.

April 10

Savant, S. A., Reible, D. D., and Thibodeau, L. J., 1987, Convective transport within stable river sediments, WRR 23(9): 1763-1768.

Hendricks, S.P. and D.S.White, 1991, Physicochemical patterns within a hyporheic zone of a northern Michigan river, with comments on surface water patterns. Can. J. Fish. Aquat. Sci., 48: 1645-1654.

Hensen, E. A., 1975, Some effects of groundwater on brown trout redds. Trans. Amer. Fish. Society, 104(1): 100-110.

April 11 12:10 -5:00PM Field trip to Frenchtown Pond Lake tools

April 15

Hope, S. J and Peterson, R. A., 1996, Pore water chromium concentration at 100-H reactor area adjacent to fall chinook salmon spawning habitat of the Hanford Reach, Columbia River. Prepared for the USDE, office of Environmental Restoration and Water management, Bechtel Hanford, Inc., Richland, WA.

Bencala, K.E. and R.A. Walters, 1983. Simulation of solute transport in a mountain pool-and-riffle stream: a transient storage model. Water Res. Research 19(3): 718-724
Harvey, J.W. and K.E Bencala., 1993. The effect of streambed topography on surface-subsurface water exchange in mountain catchments. Water Res. Research, 29 (1): 89-98.

Ward, J. V., Bretschko, G. Brunke, M., Danielopol, D., Gilbert, J., Gonser, T., and Hildrew, A. G., 1998, The boundaries of river systems: the metazoan perspective. Freshwater Biology, 40: 531-569.

April 17

Pusch, M., Fiebig, D., Brettar, I, Eisenmann,k H., Ellis, B. K., Kaplan, L. A., Lock, M. A., Naegeli, M. W. , and Traunspurger, W., 1998, The role of micro-organisms in the ecological connectivity of running waters. Freshwater Biology, 40: 453-495.

Bencala, K. E., 1993, A perspective on stream-catchment connections. N. Am Benthol. Soc., 12(1): 44-47.

Puckett, L. J. Cowdery, T. K., P. B. McMahon, L. H. Tornes, and J. D. Stoner, 2002. Using chemical, hydrologic and age dating analysis to delineate redox processes and flow paths in the riparian zone of a glacial outwash aquifer-stream system. WRR 38(8) 10.1019/2001WR000396,2002, 9-19-20

April 18 12:10-5:00 Field Trip Bandy Ranch

April 22

Stanford, J. W. and Ward, J. V., 1993, An ecosystem perspective on alluvial rivers: connectivity and the hyporheic corridor. N. Am Benthol. Soc., 12(1): 48-60.

Plamer, M. A. , 1993, Experimentation in the hyporheic zone: challenges and prospectus. . N. Am Benthol. Soc., 12(1): 84-93.

April 24

Meyer, J. L., 1997. Stream health: incorporating the human dimension to advance stream ecology. J. N. Am. Benthol. Soc., 16 (2): 439-447.

April 25 12:10-5:00 Field Trip N. Fork of Elk Creek

April 29

May 1

May 6

May 8 Final Exam

Term Paper due May 3

Additional readings catch up