1-2002

GEOL 585.01: Surface-water Groundwater Interaction - A Multi-Disciplinary Approach

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Geol 585-01

Spring 2002

Surface-water Groundwater Interaction: A Multi-Disciplinary Approach

Woessner
Tues-Thur. 10-11, Three required field trips
Text: Readings on Electronic Reserve

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 and prepare a 5 to 10 min class presentation and participate in paper discussions.
2. Attend Three ½ day field trips Tentative Schedule scheduled on Friday afternoons
   March 8 Lakes, Friday 12-5 Frenchtown Pond
   April 5, Wetlands Bandy Ranch or Swan Valley wetlands, 12 to 5
   April 26 Rivers, Ronan or Other site, 12 to 5
3. Attend 3 or more invited speaker presentations
4. Complete well cited 10 page term paper Due May 3.

Assessment:
1. Satisfactory active class participation by being prepared to present summaries of each article and active participation in discussions (only three unprepared will be accepted)
2. Satisfactory completion of quizzes if given (80% grade)
3. Satisfactory participation in scheduled field trips (attend all)
4. Completion of a 10 page term paper on one area of surface water- groundwater quantification or characterization: Physical methods, Geochemical Methods, Biological Methods

Tools

Week of January 28
Intro, Course Assignments , Groundwater Basics, Water Balance Bill

Students will be assigned parts of the Winter paper to facilitate discussion. Overheads of figures will be provided. Students are expected make a 5 to 10 min presentation and hit the important points. Then we will discuss the subject as a class.

Weeks of Feb 4, Feb 11, Feb 18

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_____

StreamFlow p. 95-98_____Overland flow p. 98-101_____

Groundwater 101-106_____Lake volume 106-108 _____

Implications 108-110_____ Conclusions110 Bill

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_____

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

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
methods_____ Chemical methods_____

Week of Feb 25

Focus on Lake Systems

All students are responsible for all papers at all times. Overheads of figures will be provided. Students are expected make a 5 to 10 min presentation and hit the important points when called upon.

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

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

Week of March 4

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.

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.

Hagerthey, S. E. and W. C. Kerfoot, 1992. Groundwater influences on the littoral communities of lakes. First International Conference on Ground Water Ecology, USEPA and AWRA, pp. 165-177.

Field Trip Friday March 8, 12 noon to 5 pm Frenchtown Pond

Week of March 11

Focus of Wetlands

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 3. Wetland types and Wetland Resources of North America Pages 53-67

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

Week of March 18 Spring Break, no class

Week of March 25

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.

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.

Week of April 1

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

Loftus, W. F., R. A. Johnson and G. H. Anderson, 1992. Ecological impacts of the reduction of groundwater levels in short-hyrperiod marshes of the Everglades. First Intern. Conf. On Ground Water Ecology, USEPA and AWRA Proceedings, April, p. 199-208.

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

Field Trip Bandy Ranch or Swan Valley Saturday April 5.

Week of April 8

Mitsch, W. J and J. G. Gosselink, 1993. Wetlands. 2nd ed. Van Nostrand Reinhold, N.Y. Wetland Creation and Restoration.p. 598-615
Galatowitsch, S. M., A. G van der Valk and R. A. Budelsky, 1998. Decision-making for prairie wetland restorations. Great Plains Research, 8, p. 137-155.

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.

Week of April 15

Focus on Streams

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.

Woessner, W. W. , 2000. Stream and fluvial plain groundw-water interactions: re-scaling hydrogeologic thought. Ground Water..

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.

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.

Week of April 22

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.

Juergens, L., and Small, M. J., 1998, River and floodplain process simulation for subsurface characterization. WRR, 34(9): 2365-2376.

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.

Field Trip Ronan Spring Creek April 26, 12 to 5

Week of April 29

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.

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

Term Paper due May 3

Week of May 6 Paper Choices will be assigned

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.

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.

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 steram-catchment connections. N. Am Benthol. Soc., 12(1): 44-47.
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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.

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

Final Class meeting during Exam week Tues May 14 8-10. Finish up

Additional 4 speakers will be scheduled. 12 to 1 During the week

Possible presentations by
Bonnie Ellis, Bio Station, Flathead lake
Jack Stanford, UM Biological Station
Rich Haurer, Biological Station
Johnnie Moore, river-gw geochemistry
Andy Shelton, Fisheries Biologist
Jack Donahue, Geography
Fishery Biologist – MT fish wildlife and Parks
Skip Roquist, Lolo Forest Hydrologist
Don Pots, Forest Hydrologist
Land and Water Consulting, Stream Reclamation