

## CURRICULUM VITAE

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### Zhi WANG

Associate Professor, Hydrology and Soil Physics  
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### Education

- 1997 Ph.D., Hydrology and Soil Physics, Katholieke Universiteit Leuven, Belgium  
1985 M. Sc., Irrigation and Drainage Engineering, Northwestern Agricultural University, China  
1982 B. Eng., Civil and Hydraulic Engineering, Xi'an University of Technology, China

### Dissertation, thesis and project design

Ph.D. Dissertation: "Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media", KU Leuven Dissertation #347, 1997. Fully published in four articles in AGU Journal **Water Resources Research**, 1997-98.

M. Sc. Thesis: "Experimental Study of the Long Border Segment Irrigation Systems". Fully published in **Irrigation and Drainage**, 5(4): 15-26 1986.

B. Eng. Project and Thesis: Design of the Multi-Stage Pumping Stations in Jingtai County, Gansu Province; Thesis on Computer analysis of the safe concrete block sizes to stabilize pipelines. 1982.

### Professional Experience

- 2008-present: Associate Professor, Department of Earth and Environmental Sciences, California State University, Fresno.  
2003-2007: Assistant Professor, Dept of Earth and Env Sciences, CSU Fresno.  
1998-2002: Post doctoral researcher, Dept of Environmental Sciences, University of California, Riverside (advisor: Prof. William A. Jury, a member of the US Academy of Sciences).  
1993-1997: Ph.D. student, Institute for Land and Water Management, Catholic University Leuven, Belgium (advisor: Prof. Jan Feyen, former director of the Institute).  
1985-1992: Assistant Professor (1988-92), Director of the Irrigation Engineering Division, College of Civil and Hydraulic Engineering, Northwestern A&F University, China.

### Honors and Awards

- Provost's Research Activity Award (\$25,000), California State University, Fresno (March 2008)  
Selected Scientist on E-print Network ([www.osti.gov/eprints](http://www.osti.gov/eprints)), US Department of Energy, Office of Scientific and Technical Information (2006-)  
Selected California Concerned Scientist, signed letters to California State Governor and Legislators, leading to new laws to limit the green house gas emissions in California (April 2005) and the destruction of forest land for bio-fuel crops (April 2009)  
Elected president of Chinese American Faculty Association at CSUF (2005-06)  
Doctoral Full Scholarship and Research Fund, K.U. Leuven (Belgium 1993-97)  
Elected President of Chinese Student Association of Leuven (1995-96)  
Outstanding Teacher, Northwestern Agricultural University, China, 1987-90

### International Services

- Guest Professor (2009-2014), Research Center for Echo-Environ. Sci., Chinese Academy of Sciences  
Adjunct Professor (2010- 2012), Institute for Water and Environment, ChangAn University, Xian, China  
HouJi Guest Professor (2010-2014), Northwest A&F University, Yangling, China

## **Memberships in Professional Organizations**

American Geophysical Union (AGU, 1998-)  
American Society of Agronomy (ASA, 1998-)  
Soil Science Society of America (SSSA, 1998-)  
European Geophysical Society (EGS, 1995-98),  
American Association for the Advancement of Science (AAAS, 1998-2000)

## **PROFESSIONAL AND SOCIETY SERVICES**

### **External Scientific Society Services and Assignments**

#### Professional Service Committees

- Member, Graduate Student Award Committee, Soil and Water Conservation (Section-6), Soil Science Society of America (2006-)
- Member, Western Regional Soil Physics Research Project W-1188 (2002-)
- Member, Central Sierra Watershed Committee (2003-)
- Member, Madera County Water Advisory Commission – Subcommittee (2008-)

#### Session Chair, International Conference

- Session #341: Surface, Subsurface Hydrological Processes and the Impact of Land Use Changes. Centennial ASA-CSSA-SSSA International Annual Meetings in **New Orleans**, LA, Nov. 4-8, 2007.

#### Invited Guest Speaker at Professional Conferences

- GIS-based modeling of water quality and water supply in Fresno River Watershed. The 12th Annual California GIS Conference (**Santa Barbara**, CA, April 5-7, 2006);
- GIS Day 2006, **Fresno**, CA, November 15, 2006
- Soil Science Society of America 91st Annual Meeting (**Salt Lake City**, UT, 1999);
- International Conference on Water-Repellent Soils (**Wageningen**, The Netherlands, 1998).

#### Invited Reviewer (External Grant Proposals)

- US National Science Foundation (NSF), Geoscience – Hydrology proposals (2000-02, 07-09)
- U.S. State Department, Civilian Research and Development Foundation proposals (2003)
- Israel Science Foundation (2009)

#### Invited Reviewer (International Journal Manuscripts)

- ASCE Journal of Irrigation and Drainage Engineering,
- Catena
- Ecological Modeling
- Environmental Fluid Mechanics
- Environmental Management
- European Journal of Soil Science
- Geoderma
- Journal of Colloid and Interface Science
- Journal of Contaminant Hydrology
- Journal of Earth System Science
- Journal of Environmental Quality
- Journal of Hazardous Materials
- Journal of Hydrology
- Science of the Total Environment
- Soil Science
- Soil Science Society of America Journal
- Vadose Zone Journal
- Water Resources Research

#### Invited Special Seminars

- Wang, Z., Effects of Unstable Flow on Water System Contamination and Remediation. Department Earth and Environmental Sciences, California State University - Fresno, **Fresno**, CA, April 5, 2002.
- Wang, Z., Effects of Unstable Flow on Water System Contamination and Remediation. Department Environmental Sciences, Rutgers University, The State University of New Jersey, **New Brunswick**, NJ, March 13, 2002.
- Wang, Z., Measurement and Prediction of Unstable Flow in the Vadose Zone and Groundwater Aquifers, Department of Civil and Environmental Engineering, University of Tennessee, **Knoxville**, TN, February 13, 2002.
- Wang, Z., Measurement and Prediction of Preferential Flow and Solute Transport in Soils, Soil and Water Science Department, University of Florida, **Gainesville**, FL, May 3, 2001.
- Wang, Z., Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media, Department of Environmental Sciences, University of California, **Riverside**, CA, April 9, 1998.

### **California State University, Fresno Campus Committees and Duties**

- University Graduate Committee (2007-2010)
- University Task Force on Grants and Contracts, CSUF (2002-03);
- University Air Quality Resources Group, CSUF (2003-)
- University Coordinator, Unitrack AP Environmental Science program for high schools (Clovis West, Clovis and CART) since 2003
- CSU Fresno RISE Program faculty mentor (2004-)
- College Curriculum Committee (2004-2008)
- College International Education Committees (2005-2008)
- Inter-College Equal Employment Officer (EEO) on Faculty Search committees – Department of Industrial Technology and Department of Viticulture (2007 and 2008)
- Department Faculty RTP (retention, tenure and promotion) Committee Chair (2008)
- Department Graduate Faculty Committee (2002-)
- Undergraduate Program Coordinator, the Joint BS Environmental Science Program with CSU Fresno and UC Riverside (2005-)
- Department GIS computer lab supervisor (2002-)
- Web master: Department website ([www.csufresno.edu/ees](http://www.csufresno.edu/ees), 2002-)
- Web master, Asian Faculty and Staff Association of CSUF website ([www.csufresno.edu/afsa](http://www.csufresno.edu/afsa)) (2009-)

## **TEACHING**

### **Teaching and Supervising Activities**

#### New Courses Developed and Cataloged at CSU Fresno

1. EES 004: Environmental Science - for GE (taught since Fall 2006)
2. EES 108: Soil and Water Science (approved in Fall 2004)
3. EES 109: Atmospheric Science (approved in Fall 2004)
4. EES 178: Geostatistics (taught since Fall 2006)
5. EES 230: Contaminant Transport (graduate course approved in Fall 2008)
6. NSCI 115: Environmental Earth and Life Science (Web-based, taught since Spring 2007)

#### Courses Taught at CSU Fresno

1. EES 004: Environmental Science (2006-)
2. EES108: Soil and Water Science (2010-)
3. EES 112: Earth System History (2009-)

4. EES 117: Hydrogeology (2002)
5. EES 177: Quantitative Methods for Earth Science (2003-2004)
6. EES 178: Geostatistics (2006-)
7. EES 180: Computer Applications in Geology (2003-2006)
8. EES 186: Environmental GIS (2002- present)
9. EES 217T: Contaminant Hydrology (2003-04)
10. EES 217T: Unsaturated Zone Hydrology (2003-04)
11. NSCI 115: Environmental Earth and Life Science – for distance learning mode (2004-)
12. NSCI 115: Environmental Earth and Life Science – for web-based instruction (2007-)
13. NSCI 115: Environmental Earth and Life Science (2002-2005)

Courses Taught Elsewhere

- Surface Irrigation Engineering - Design and Field Evaluations, graduate course taught at **Universidad de Cuenca, Ecuador** (Feb-March 1997)
- Irrigation and Drainage Engineering (undergraduate), **Northwestern Agricultural University, China** (1985-1992)
- Economic Evaluation of Irrigation Projects (undergraduate), **Northwestern Agricultural University, China** (1985-1992)

Funded Teaching Project at CSU Fresno

- CSU Fresno Assessment funding Award (\$5,000), Office of the Provost and Office of Institutional Assessment, Assessment and Planning (2005-06).

Visiting Scientist and Scholar Advising

Zili He, Northwest A&F University, China  
 Yudong Lu, ChangAn University, China

Nov 2007- July 2009  
 Nov 1010 – Oct 2011

Graduate Student Advising at CSU Fresno (as Major Advisor)

<i>Student name</i>	<i>Degree</i>	<i>These Topic</i>	<i>Completion Date</i>
James R. Meier	MS Geology	Groundwater bank	<b>Aug 2005</b>
Ori Sartono	MS Geology	Fractured rock Aquifer	<b>Aug 2007</b>
Sana Alsaoudi	MS Geology	SJR Water source isotope	<b>Dec 2007</b>
Jorge Baca Jr	MS Geology	Fresno R watershed erosion	<b>Oct 2009</b>
Doug DeFlitch	MS Geology	SJ River sediment transport	<b>April 2010</b>
Joe Knight	MS Geology	SJV Selenium transport	Aug 2006- present
Ronald Holcomb	MS Geology	Watershed assessment	Aug 2004- present
Ashley Ross	MS Geology	Kings R Watershed Erosion	Aug 2009-present

Graduate Student Advisory Committees at CSU Fresno

<i>Student name</i>	<i>Degree</i>	<i>Department</i>	<i>Major Advisor</i>	<i>Completion Date</i>
Nelson F. Bernal	MS Geology	EES	John Suen	Dec 2007
Rose Marrero-Cuebas	MS Geology	EES	John Suen	Dec 2007
Susan Bratcher	MS Geology	EES	John Suen	Dec 2007
Sean P. Boyd	MS Geology	EES	Fraka Harmsen	in progress
Zachary Hoover	MS Biology	Biology	Steve Blunmenshire	in progress
Brett Moore	MS Biology	Biology	Steve Blunmenshire	in progress

Undergraduate Thesis Advising at CSU Fresno (as Major Advisor)

<i>Student name</i>	<i>Degree</i>	<i>These Topic</i>	<i>Graduation Date</i>
Louis Tesseo	B. Sc. Geology	GIS Snow-pack calculation	<b>May 2007</b>

Undergraduate Program Advising (as major advisor)

- Geology majors (4): Graduated in 2005-08.
- Environmental Science majors (27): As Coordinator of the Joint BS in Environmental Science program between CSUF and UCR:

## RESEARCH

### Research Interests

- Measurement and prediction of surface and subsurface water flow and contaminant transport
- Fluid Mechanics in porous media including soils and rocks and underground aquifers
- Evaluation, measurement and prediction of soil and groundwater quality
- Climate change effects on hydrological processes and eco-system sustainability at various scales
- Measurement and prediction of unstable (finger) flow in soils and geological formations
- GIS applications in natural resources, watershed and groundwater management and modeling
- Development and calibration of hydraulic devices and structures for discharge measurement
- Irrigation engineering and pumping system design, simulation and installation

### Publications

#### In Peer-reviewed Journals:

1. Liu, X.H., X. Yi, J.Q. He, Z. Wang. Biogeochemistry and nitrogen transform in unsaturated soils of JingHuiQu Irrigation District, China. (submitted) 2010.
2. Liu, X.H., B. He, Z. Li, J. Zhang, L. Wang, Z. Wang. Influences of land terracing on agricultural and ecological environment in Loess Plateau regions, China. **Environmental Earth Sciences**, DOI: 10.1007/s12665-010-0567-6, 2010.
3. Liang, X., D. Su, S. Yin, and Z. Wang. Leaf water absorption and desorption functions for three turfgrasses. **Journal of Hydrology**, 376: 243–248, 2009.
4. He, Z., Z. Wang, C.J. Suen, and X. Ma. Climate Change Impacts on Water Availability in the Upper San Joaquin River Watershed, California. (submitted) 2009.
5. Yu, Xinxiao, Derong Su, Yuan Tian, and Z. Wang. Performance of the ridge-furrow rain harvesting system in semiarid regions of China. (resubmitted), 2009.
6. Li, He-li, Huai-en Li, Zhi Wang, Wen-juan Shi. Research of Finger Flow in Porous Media: Review and Perspective, **Soils**, 41: 27-33, 2008.
7. Kim, S.B., H.S. On, D.J. Kim, W. A. Jury, and Z. Wang. Determination of bromacil transport as a function of water and carbon content in soils. **Journal of Environmental Science and Health Part B**, 42, 529–537, 2007.
8. Wang, Z. Watershed Monitoring and Hydrologic Simulation using GIS, **CSU Geospatial Review**, Vol. 4, Spring 2006.
9. Mathieu, J., Z. Wang, J. Feyen, D. Elrick and M. Vanclooster. Correction to “Prediction of fingering in porous media”. **Water Resources Research.**, Vol. 41, No. 4, W04005, doi:10.1029/2004WR003831, 2005.
10. Wang, Z. Invited Book Review: Seepage in soils – principles and applications by Lakshmi N. Reddi. John Wiley & Sons, Inc. **Vadose Zone Journal**, 3:728-729, 2004.
11. Wang, Z., W.A. Jury, A. Tuli, and D.J. Kim. Unstable flow during redistribution: Controlling factors and practical implications. **Vadose Zone Journal**, 3: 549-559, 2004.
12. Wang, Z, A. Tuli, and W.A. Jury. Unstable flow during redistribution in homogeneous soil, **Vadose Zone Journal**, 2: 52-60. 2003.
13. Jury, W.A., Z. Wang, and A. Tuli. A conceptual model of unstable flow in unsaturated soil during redistribution, **Vadose Zone Journal**, 2: 61-67, 2003.

14. Wang, Z., L. Wu, T. Harter, J. Lu and W.A. Jury. A field study of unstable preferential flow during soil water redistribution. **Water Resources Research** 39 (4): 1075, doi:10.1029/2001WR000903. 2003.
15. Wang, Z., A. Chang, L. Wu, and D. Crowley. Assessing the soil quality after long-term wastewater irrigation - principal component and factor analysis. **Geoderma** 114: 261-278, doi:10.1016/S0016-7061(03)00044-2. 2003.
16. Wang, Z, J. Lu, L. Wu, T. Harter, and W.A. Jury. Visualizing preferential flow in field soils using ammonium carbonate and a pH indicator, **Soil Science Society of America Journal**, 66, 347-351, 2002.
17. Wang, J., B. Fu, Y. Qiu, L. Chen, and Z. Wang. Geostatistical analysis of soil moisture variability on Da Nangou catchment of the loess plateau, China. **Environmental Geology**, 41: 113-120, 2001.
18. Jury, W. A., and Z. Wang. Unresolved Problems in vadose zone hydrology and contaminant transport. In **Dynamics of Fluids in Fractured Rock**, AGU Geophysical Monograph 122, edited by B. Faybishenko, P. A. Witherspoon and S. M. Benson. pp. 67-72, 2000.
19. Wang, Z., L. Wu, and Q. J. Wu. Water-entry value as an alternative indicator of soil water repellency and wettability, **Journal of Hydrology**, 231-232: 76-83, 2000.
20. Wang, Z., Q.J. Wu, L. Wu, C.J. Ritsema, L.W. Dekker and J. Feyen, Effects of soil water repellency on infiltration rate and flow instability. **Journal of Hydrology**, 231-232:265-276, 2000.
21. Zerihun, D., J. Feyen, J. M. Reddy and Z. Wang. Minimum cost design of furrow irrigation systems. **Transactions of the ASAE**, 42(4): 945-955, 2000.
22. Wang, Z., Jan Feyen, and D.E. Elrick. Prediction of Fingering in porous media. **Water Resources Research**, 34: 2183-2190, 1998.
23. Wang, Z., Jan Feyen and C. J. Ritsema. Susceptibility and predictability of conditions for preferential flow. **Water Resources Research**, 34: 2169-2182, 1998.
24. Wang, Z., J. Feyen, M. Th. van Genuchten and D. R. Nielsen. Air entrapment effects on infiltration rate and flow instability. **Water Resources Research**, 34(2): 213-222, 1998.
25. Wang, Z., J. Feyen, D. R. Nielsen and M. Th. van Genuchten. Two-phase flow infiltration equations accounting for air entrapment effects. **Water Resources Research**, 33(12): 2759-2768, 1997.
26. Zerihun, D, Z. Wang, J. Feyen and J. M. Reddy. Empirical functions for dependent furrow irrigation parameters. 2: Applications, **Irrigation Science**, 17:121-126, 1997.
27. Zerihun, D., Z. Wang, S. Rimal, J. Feyen and J. M. Reddy. Analysis of surface irrigation performance terms and indices. **Agricultural Water Management**, 34:25-46, 1997.
28. Wang Z., D. Zerihun, and J. Feyen. General irrigation efficiency for field water management. **Agricultural Water Management** , 30(2): 123-132, 1996.
29. Wang, Z., J. M. Reddy and J. Feyen. Improved 0-1 programming model for optimal flow scheduling in irrigation canals, **Irrigation and Drainage Systems**, 9: 105-116, 1995.
30. Wang, Z. and J. Feyen. Unsaturated infiltration properties affected by soil air pressure. **Unsaturated Soils** (edited by E. E. Alpnso and P. Delage, A.A. Balkema Publisher, Rotterdam), Vol. 1: 417-422, 1995.
31. Wang, Z.Y., Z. M. Zhen and Z. Wang. The use and conveyance of hyper-concentrated turbid flow. **ICID Bulletin CIID**, 43(2) 117-126, 1994.
32. Lin, X. C., Z. Wang, W. Meng, L. Zhao, W.Z. Fan and Q.L. Shen. A quantitative evaluation of on-farm irrigation methods and techniques, **Journal of Northwestern Agricultural University** (Acta Univ. Agric. Boreali-occidentalis), 23(5): 17-22, 1995.
33. Wang, Z., F. S. Zhu and X. M. Liu. Experimental study of parabolic throat-less flumes. **Journal of Water Resources**, 23(7):12-23, 1994.
34. Wang, Z., Ai-Min Zhang and De-Hua Liao. Field study of on-farm irrigation efficiencies in XiYingHe irrigation district. **Water Resources & Water Engineering**, 4(1):17-25, 1993.
35. Wang, Z. and F. Zhu. Optimal flow regulation in canal systems using 0-1 programming method, **Irrigation & Drainage**, 11(3): 8-13. 1992.

36. Wang, Z., Parabolic cut-throat flumes for U-shaped canals, **Shaanxi Water Conservancy**, (4): 16-19, 1990.
37. Xiong, Y.Z., S. Kang, Z. Wang, X.C. Ling, and Z.N. Wang. Water saving irrigation in semi-arid regions of northwestern China, in **Water-Saving Agriculture and Development of Irrigation & Drainage Technologies**, Oct., 1989, 16-21, 1989.
38. Wang, Z. Recession/advance model for design of Long Border Segment Irrigation systems, **People's Yellow River**, 1989(3): 33-37, 1989.
39. Wang, Z. Evaluating application parameters of soil infiltration characteristics, **Irrigation & Drainage and Small Hydro-Power**, 1989(1): 30-33, 1989.
40. Wang, Z., An analytical model for predicting surface flow advance and the rational length of borders, **Irrigation & Drainage and Small Hydro-Power**, (1): 30-33, 1987.
41. Wang, Z. A mathematical model for border irrigation flow advancement, **Journal of Northwestern Agricultural University** (Acta Univ. Agric. Boreali-occidentalis, China), 15(4): 47-54, 1987.
42. Wang Z. and F. Zhu. Venturi-pipe devices for open canal water measurement, **Water Measurement Techniques and Devices**, 4: 58-64, 1986.
43. Wang, Z. Simulation and design of Long Border Segment Irrigation Systems, **Irrigation & Drainage**, 5(4): 15-26, 1986.

Abstracts in Conference Proceedings:

1. Ori Sartono, Z. Wang, C. J. Suen, and K. D Schmidt. Parameterization of a fractured hardrock aquifer in western foothills of the Sierra Nevada, California, *GSA Abstracts with Programs*. Vol. 39, No. 6, 2007.
2. Wang, Z., William A. Jury, and Atac Tuli. Observation and Modeling of Unstable Flow during Soil Water Redistribution. *Proceedings of the 2nd International Symposium on the Dynamics of Fluids in Fractured Rock*, Lawrence Berkeley National Laboratory, Berkeley, CA, Feb. 10-12, 2004.
3. Wang, Z. Does Water Flow Become Unstable in All Soils? *Proceedings of the Twenty-Fourth Annual Central California Research Symposium*. California State University, Fresno. CA, April 17, 2003.
4. Wang, Z. Effects of soil water repellency on infiltration rate and flow instability. International Workshop on "Soil Water Repellency - origins, assessment, occurrence, consequences, modeling and amelioration", Wageningen, The Netherlands, September 2-4, 1998.
5. Wang Z. and J. Feyen. Effects of air entrapment on water flow. *Proceedings of the International Conference Kearney Foundation of Soil Science, Vadose Zone Hydrology: Cutting across Disciplines*. University of California, Davis, sep. 6-8:163-164, 1995.
6. Wang, Z. and J. Feyen. Inter-displacement behaviors between air and water during unsaturated infiltration. In: *Annales Geophysicae of the XXth general Assembly of the EGS*, Hamburg, Germany, Apr. 3-4, 7pp. 1995.
7. Wang, Z. and J. Feyen. Effect of air entrapment on water flow and solute transport. *Proceedings of International workshop on Water and Matter Transport at Various Scales*. Leuven, Belgium April 18-19, 1995.
8. Zerihun D, Z. Wang, J. Feyen and J. M. Reddy. Performance Curves for Border irrigation. *Proceedings of the first International Conference on Water Resources Engineering*, ASCE (August 14-18, 1995, San Antonio, Texas, USA), edited by W.H. Espey, Jr. and P.G. Combs, Vol. 2: 1595-1599, 1995.
9. Feyen J., W. Mulonga, F. Liu, D. Zerihun and Z. Wang, 1994. Computer applications in irrigation and drainage education, research and practice. *Proceedings of the 5th MANCID (Malaysian National Commission on Irrigation and Drainage) Annual National Conference on "Hydroinformatics - Information technology for Irrigation, Drainage and Water Resources*. Pangkor Island, Malaysia. Nov. 25-27, 1996.
10. Wang, Z. and J. Feyen. A criterion for design, evaluation and optimization of on-farm irrigation systems. *Proceedings of the 45th ICID International Executive Council Meeting and 17th European Regional Conference on "Effective and ecological sound use of irrigation waters"*, Varna, Bulgaria, May, 1994.

11. Wang, Z. and F. Zhu. Parabolic throat-less flumes for open channel discharge measurement, *Proceedings of the International Conference on Agricultural Engineering* (Beijing): V86-V92, 1992.
12. Wang, Z. and F. Zhu. Water-saving agriculture in Shaanxi Province, *Proceedings of the Symposium on Water Resources Utilization in NW China*, October, 1990, Xi'an. pp:20, 1990.

Conference Presentations (underlined are Students and Advisees)

1. Wang, Z. (Oral presentation). Measurement and Modeling of Soil Erosion in the Sierra Nevada, California. Chinese Academy of Sciences International Workshop on "Ecosystem processes and services", **Orlando**, Florida, USA, Nov 20-21, 2010.
2. Wang, Z., Jorge Baca, Zili He, Steve Blumenshine (poster). Effects of the First Floods on Water Quality and Sediment Transport in the Sierra Nevada Foothill Streams, California. AGU 2010 Fall Meeting, **San Francisco**, USA, December 13-17, 2010.
3. Wang, Z. (oral presentation). The effects of first floods and soil erosion on water quality in the Fresno River watershed. Central Sierra Watershed Committee meeting. **Oakhurst**, California, April 28, 2010.
4. DeFlicht, Douglas., Zhi Wang (oral presentation). Measurement and monitoring of bedload sediment transport along the upper San Joaquin River. The 31st Annual Central California Research Symposium, **Fresno**, California, April, 23, 2010.
5. Wang, Z. (oral presentation). Assessment of eco-system health, services and restoration - Case studies in California and the Loess Plateau of China. Chinese Academy of Sciences. **Beijing**, China, April 2, 2010.
6. Wang, Z. (oral presentation). Eco-hydrology, infiltration, irrigation engineering and hydrogeology with applications in California and the Loess Plateau of China. Institute for Water and Environment, ChangAn University, **Xi'An**, China, January 2-18, 2010.
7. Wang, Z. (oral presentation). Eco-hydrological measurement and simulation of watershed sustainability with respect to global climate change. Chinese Academy of Sciences. **Beijing**, China, Dec 28, 2009.
8. Suen, C. John, Bernad. F. Nelson, Ori Sartono, Z. Wang (poster presentation). Using isotope hydrology, fracture mapping, and pump tests to characterize groundwater flow through the fractured rock terrane of the Sierra Nevada foothills, GSA Annual Meeting, **Portland**, Oregon, October 18-21, 2009.
9. Wang, Z., Zili He, John Suen, Xiaoyi Ma (Oral presentation). Climate Change Impacts on the Headwaters of San Joaquin River, California. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
10. Baca, Jorge Jr., Zili He, Zhi Wang, Steve Blumenshine (Poster). Estimating Soil Erosion Potential within the Fresno River Watershed using the RUSLE model and GIS. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
11. Moore, Brett, Steve Blumenshine, Zhi Wang, Zili He (Poster). Influence of sedimentation on the distribution of macroinvertebrates in the upper Fresno River. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
12. Wang, Z. (oral presentation). Estimating Soil Erosion Potential in the Fresno River Watershed using the RUSLE Model and GIS. Central Sierra Watershed Committee meeting. **Oakhurst**, California, May 27, 2009.
13. Wang, Z. (oral presentation). Impacts of the first flood events and sedimentation on water quality in the Fresno River watershed. Central Sierra Watershed Committee meeting. **Oakhurst**, California, February 25, 2009.
14. Wang, Z., and S. Blumenshine (oral presentation). Monitory plan for the upper Fresno River watershed. Oakhurst area public information meeting sponsored by Central Sierra Watershed Committee. **Oakhurst**, California, October 16, 2008.



15. Wang, Z., Louis A. Tesseo (Poster). Upper San Joaquin River: A Geostatistical Analysis of the Snowpack water yield in the upper San Joaquin River watershed. GIS Day at Fresno State, **Fresno**, CA, Nov. 14, 2007.
16. Ori Sartono, Nelson F. Bernal, C. John Suen, Zhi Wang (Poster). Groundwater Flow through a Fractured Rock Aquifer in the Sierra Nevada Foothills of California. AGU 2007 Fall Meeting, **San Francisco**, California, December 10-14, 2007.
17. Wang, Z., Louis A. Tesseo (Oral presentation). Spatial Analysis of Snowpack Water Resources in Sierra Nevada for San Joaquin River. International Annual Meetings of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America in **New Orleans**, Louisiana. Nov. 4-8, 2007.
18. Xinxiao Yu, Derong Su, Yuan Tian, Zhi Wang (Oral presentation),. Performance of ridge and furrow water-harvesting system in Loess Plateau of China. International Annual Meetings of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America in **New Orleans**, Louisiana. Nov. 4-8, 2007.
19. Ori Sartono, Zhi Wang, C. John Suen, and K. D Schmidt (Poster). Parameterization of a fractured hard rock aquifer in western foothills of the Sierra Nevada, California, GSA Annual Meeting and Exposition. **Denver**, Colorado, Oct 28-31, 2007.
20. Wang, Z. (Invited Oral Presentation). Geospatial Analysis in Earth and Environmental Sciences, GIS Day 2006 for San Joaquin Valley, **Fresno**, CA, November 15, 2006.
21. Wang, Z. (Invited Oral presentation). GIS-based modeling of water quality and water supply in Fresno River Watershed. The 12th Annual Cal GIS Conference, Fess Parker's Doubletree Resort, **Santa Barbara**, CA, April 5-7, 2006.
22. Wang, Z. (Oral presentation). Characterizing Mass and Energy Transport at Different Scales. Western Regional Soil Physics Research Project W-1188 Annuposital Meeting, Desert Research Institute, 755 E. Flamingo Road, **Las Vegas**, NV, Jan. 2-4, 2006.
23. Wang, Z., Ronald E. Holcomb, Ori Sartono, Jim Meier (Oral presentation). Moving Toward GIS-Based Modeling of Watersheds and Groundwater Banks in San Joaquin Valley. Western Regional Soil Physics Research Project W-1188 Annual Meeting, **Las Vegas**, NV, Jan. 2-4, 2005.
24. Wang, Z., William A. Jury, and Atac Tuli. (Poster presentation). Observation and Modeling of Unstable Flow during Soil Water Redistribution. The 2nd International Symposium on the Dynamics of Fluids in Fractured Rock, Lawrence Berkeley National Laboratory, **Berkeley**, CA, Feb. 10-12, 2004.
25. Wang, Z., S. Blumenshine, and M McClanahan. (Oral presentation). Fresno River Monitoring. Central Sierra Watershed committee meeting, **Oakhurst**, CA, April 28, 2004.
26. Wang, Z., William A. Jury, and Atac Tuli. (Oral presentation). Critical depth of infiltration for unstable flow during redistribution. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 4-7, 2004.
27. Wang, Z., O. Satono, S. Blumenshine, and M McClanahan. (Oral presentation). GIS-Aided Watershed Modeling. GIS Day 2003, California State University, **Fresno**, CA, November 19, 2003.
28. Wang, Z., William A. Jury, and Atac Tuli. (Oral presentation). Does Water Flow Become Unstable in All Soils? Twenty-Fourth Annual Central California Research Symposium. California State University, **Fresno**. CA, April 17, 2003.
29. Wang, Z., S. Blumenshine, and M McClanahan. (Oral presentation). Fresno River Monitoring Plan and initial results. Central Sierra Watershed committee meeting, **Oakhurst**, CA, September 4, 2003.
30. Wang, Z. (Oral presentation). Contaminant flow in water. Western Athletic Conference (WAC) Universities Academic Alliance Symposium on Energy & Water Issues in Homeland Security and Health Disparities. **San Jose, California**. June 5-7. 2003.
31. Jury, W.A., and Z. Wang. (Oral presentation). Experimental and theoretical studies of unstable flow during soil water redistribution. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 6-8, 2003.

32. Wang, Z. A. Tuli and W. A. Jury. (Poster presentation) Evidence of unstable preferential flow during soil water redistribution. AGU 2002 Fall Meeting, **San Francisco**, USA, December 4-10, 2002.
33. Wang, Z., W.A. Jury and L. Wu. (Oral presentation). Preferential flow in non-structured field soils. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 2-5, 2001.
34. Wang, Z., W.A. Jury and L. Wu. (Oral presentation). Measurement and prediction of unstable flow, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America 91<sup>ST</sup> Annual Meeting, **Salt Lake City**, Oct. 31 – Nov. 4, 1999.
35. Jury, W.A., and Z. Wang. (Oral presentation by Dr. Jury). Recent Developments and Unresolved Problems in Vadose Zone Hydrology and Contaminant Transport. International Symposium (in Honor of Paul A. Witherspoon) on "Dynamics of Fluids in Fractured Rocks: Concepts and Recent Advances", Ernest Orlando Lawrence Berkeley National Laboratory, **Berkeley**, California, February 10-12, 1999.
36. Wang, Z. and L. Wu. (Oral presentation). Effects of soil water repellency on infiltration rate and flow instability. International Workshop on "Soil Water Repellency - origins, assessment, occurrence, consequences, modeling and amelioration", **Wageningen**, The Netherlands, September 2-4, 1998.
37. Wang, Z. (Oral presentation). Prediction and observation of preferential flow in porous soils. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 5-8, 1998.
38. Wang, Z., Jan Feyen, D.E. Elrick. (Poster presentation). Prediction of fingering in porous media. AGU 1997 Fall Meeting, **San Francisco**, USA, December 8-12, 1997.
39. Wang, Z., Jan Feyen and C. J. Ritsema. (Poster presentation). Susceptibility of conditions for preferential flow. 22nd General Assembly of EGS, **Vienna**, Austria, 21-25 April 1997.
40. Wang, Z., and J. Feyen. (Presentations, demonstrations, field experiments, exercises and exams). Surface Irrigation System Measurement and Design, International Post-graduate Program by University of Leuven and Universidad de Cuenca, **Cuenca**, Ecuador, Feb 23-Mar. 8, 1997.
41. Wang, Z., J. Feyen. (Poster presentation). Two-phase flow infiltration equations accounting for air entrapment effects, EGS XXI General Assembly, **The Hague**, The Netherlands, May 6-10, 1996.
42. Wang, Z. and J. Feyen. (Poster presentation). Fingering Flow Visualization in Two Dimensional Columns. Gordon Research Conference on "Modeling of Flow in Permeable Media", Proctor Academy, **Andover**, New Hampshire, USA, August 4-9, 1996.
43. Wang, Z., J. Feyen. (Poster presentation). Air entrapment effects on infiltration rate and flow instability. International workshop on "Vadose Zone Hydrology: Cutting across disciplines", University of California, **Davis**, Sept. 6-8, 1995.
44. Wang, Z. and J. Feyen. (Oral presentation by Dr. DJ Kim). Unsaturated infiltration properties affected by soil air pressure. First International Conference on Unsaturated Soils, **Paris**, France, Sept. 6-8, 1995.
45. Wang, Z. and J. Feyen. (Oral presentation). Inter-displacement behaviors between air and water during unsaturated infiltration. European Geophysical Society (EGS) X General Assembly, **Hamburg**, Germany, April 3-7, 1995.
46. Wang, Z. and J. Feyen. (Oral presentation). Effect of air entrapment on water flow. Workshop on Water and Matter Transport at Various Scales. **Leuven**, Belgium, April 18-19, 1995.
47. Wang, Z. and J. Feyen. (Oral presentation). A criterion for design, evaluation and optimization of on-farm irrigation systems. 45th ICID Executive Council Meeting & 17th European Regional Conference on the theme "Effective and ecological sound use of irrigation waters with special reference to European countries", **Varna**, Bulgaria, May 16-22, 1994.
48. Wang, Z. and F. Zhu. (Oral presentation). Parabolic cutthroat flumes for open channel discharge measurement. International Conference on Agricultural Engineering, **Beijing**, China. Oct. 1992.

#### On-going Research Projects

1. **DOD: Shallow Saline Aquifer Monitoring Program at NAS Lemoore**. 2010-1011 (\$63,572). Principal Investigator: Z. Wang (hydrologist). Collaborators: Paul Cropsie (Biology at CSUF) and Bruce Roberts (Plant Science at CSUF) on "NAS Lemoore Plant and Wildlife Survey" (a separate

grant). The major objective of this project is to develop a groundwater monitoring program in concert with parallel studies on plant and wildlife habitats at NSA Lemoore. A Rockwork model will be developed to study the saline groundwater dynamics and the geology of the aquifers. Based on that, MODFLOW and GIS models will also be created for trend analysis and predictions. Recommendations on water supply, plant and wildlife choices will be developed based on specific studies on the shallow saline groundwater aquifer, saline-sodic soil, irrigation water quality, plant suitability and wildlife habitats.

#### Recently Funded Research Projects

2. **California Department of Water Resources (CA-DWR): Upper Fresno River Watershed Assessment Project.** 2008-2010 (\$187,366). Principal Investigators: Z. Wang (hydrologist) and S. Blumenshine (ecologist). Collaborators: Madera County and Central Sierra Watershed Committee. Major objectives are to develop GIS-based nutrient loading and vegetation distribution models that are capable of analyzing the fate and transport of nutrients and invasive plants in the Fresno River watershed. Using the data collected by the team, chart and quantify the septic systems, roads, water quality and species distribution within the watershed, identify watershed land use patterns associated with high nutrient loads and invasive weeds, and finally create a GIS-based geodatabase information system (web server) to help identify areas where nutrient input are highest, sources of point or non-point nature, and measures for watershed restoration.
3. **CA-DWR: Upper San Joaquin River Watershed Assessment Project.** 2008-2010 (\$94,778). Principal Investigator: John Suen (hydrogeologist), Co-PIs: Z. Wang (hydrologist) and S. Blumenshine (ecologist). Collaborators: Sierra Resources Conservation District and Central Sierra Watershed Committee. Major objectives are to conduct a comprehensive assessment of the watershed in the following areas: Evaluation of water quantity and quality concerning the Sierra Nevada snow packs, streams, lakes and groundwater; Climate change effects on the snow packs and the entire ecosystems; Impacts of regional air pollution on water quality and vegetation in the watershed; Status of hydrogeology, topography, soils and other physical aspects; Status of forest, aquatic habitats, biodiversity, invasive species and groundwater dependent ecosystems; Elements of hydrologic cycle including precipitation, evapotranspiration, groundwater recharge and infiltration; and Policy and management issues pertinent to the long-term sustainability and environmental conservation of the watershed.
4. **US National Science Foundation (NSF): “Geoscience Mentoring, Education, Training, Research and Outreach (METRO) Center at CSU Fresno.”** NSF OEDG (Opportunities for Enhancing Diversity in the Geosciences) program. PI: Alam Hassan; Collaborators: Zhi Wang et al. **Funded for \$1.4 millions** to set up the METRO Center at CSU Fresno.
5. **NSF: Acquisition of an X-ray Diffraction Instrument.** 2004-2005. Total funding \$148,421, PI: Keith Putirka, Co-PI: Z Wang. The range of research projects include: 1) issues in regional geology, volcanology and metamorphic petrology, 2) the identification of asbestiform minerals related to construction projects, 3) igneous barometry and the refinement of unit cell parameters of clinopyroxenes, 4) study of soil mechanics and soil contamination through the analysis of clay minerals and gypsum mineral fractions in agricultural soils, 5) problems in groundwater flow, and the relationship between mineralogy and clay fraction on flow-rates and mode of water transport through soils, and 6) the analysis of dust particles produced from dairy operations, recognized as a significant health hazard in regard to air quality.
6. **California EPA: Fresno River-Hensley Lake Water Quality Monitoring.** 2003-04. Total funding \$134,600. Principal Investigator: Z Wang and S. Blumenshine. The main tasks include: Sampling and monitoring of water discharge, water quality (physical, nutrients, algae) and disease-causing bacteria concentrations along the main Fresno River, its 7 tributaries and the Hensley Lake with a total of 24 monitoring sites.

## Research Proposals and Funding History

7. **NSF: Resilience in an urban socioecological system: water management as a driver of landscape and biodiversity in Fresno-Clovis, California.** Submitted on July 7, 2009 to NSF ULTRA program. PIs: Madhusudan Katti et al.; Participants: Zhi Wang et al. The requested total budget was \$299,232, **pending** for review and decision.
8. **CSUF-ARI (Agricultural Research Initiative): The Impact of Climate Change and Air Quality on Central San Joaquin Valley Agriculture** (Pre-proposal). Submitted on September 8, 2009. PI. Donald Hunsaker; Co-PIs: Fraka Humsen, Alam Hassan; Collaborators: Charles Krauter, Zhi Wang. The requested total funding was \$450,000, **pending** for review and decision.
9. PI, **Measurement and Modeling of Unstable Flow in Soils**, NSF 2008, not funded. Collaborators: Ming Xiao (CSUF), Jiri Simunek (UC Riverside) and Atac Tuli (UC Davis).
10. PI, **Development of Sequentially Activated Micro-Flood Irrigation Systems to Reduce Agricultural Runoff**. CSU ARI, 2007-08, not funded (collaborating with CIT–Center of Irrigation Technology at CSU Fresno). We propose to develop and implement a Sequentially Activated Micro–Flood Irrigation System (SAMFIS) in which a low cost Sequential Irrigation Valve will be used as the critical water-flow control device. The new concept of surface irrigation technology will result in a scientifically designed and technically programmed system that can be achieved without changing the existing field layouts and without arbitrary human intervention.
11. PI, **Water and Nitrogen Management in Surface Irrigated Crop Production Systems in San Joaquin Valley**. California DWR – Water Use Efficiency Program. 2007-08, not funded. This project seeks to develop new design and management approaches and guidelines for improving the efficiencies of Irrigation and ferti-gation in San Joaquin Valley. A training program will be developed to teach and demonstrate effectiveness of using surface irrigation models to improve water use efficiencies. Application guidelines will be developed for field water and fertilizer management.
12. Co-PI, **Establishing a Water Coalition Support Center in CA’s Central Valley**. USDA 2004-07, \$1.2 million, not funded (Co-PIs: D. Wichelns and K. Longley). The goal is to establish a Water Coalition Support Center that will provide technical, scientific, and policy expertise required to support efforts to improve water quality under the Conditional Waiver Program.
13. PI, **Internal Grant from CSU Fresno: Assessment Proposal Funding Award**. Office of Institutional Research, Assessment and Planning (\$5,000. Co-PI: Robert Dundas). This project was designed to conduct a comprehensive test on the prerequisite courses before students begin the field course (Geology 107- Advanced Field Methods, 3 units, 9 lab hours). This assessment will permit us to evaluate student preparedness for the culminating experience course and to identify areas where the Department could improve the curriculum and note areas where we are doing well.
14. PI, **Internal Grants from College of Science and Mathematics at CSUF**. Faculty Performance Award (\$6,000) - 2003-2007; Faculty Research Equipment Awards (\$66,686) including **Hydrology and Environmental Science Lab Setup**: EasyChem Analyzer (\$45,000), 2005-06, Dewpoint Water potentiometer-WP4-T (\$7,242.29), 2004-05, Data acquisition system (\$5,641), 2003-04, Portable TDR for measuring soil water content (\$8,803), 2002-03; College Minigrants: Education-Assisted Measurement and Modeling of Watersheds and Groundwater (\$2,500), 2005-06, Measurement and modeling of stormwater and contaminant flow (\$2,500), 2004-05, Light transmission investigation of water and contaminant movement in soils (\$2,500), 2003-04; College Scholarly and Creative Activity Award (24 WTUs), 2002-06; College Instructional Equipment award - **GIS Lab upgrade**: 14 computers, one scanner and one plotter (~\$40,000) 2004-05, 12 computers and monitors (\$7,216) 2003-04; New Faculty Start-up fund (\$20,000), 2002-03.
15. Co-PI, **Prediction of DNAPL Fate in Heterogeneous Aquifers Under Uncertainty**. (pending, collaborating with Los Alamos National Lab, UC Riverside and Colorado State University). DOE Environmental Management Program, 2004-06 (not funded). Develop an improved predictive capability of DNAPL fate in heterogeneous aquifers with uncertainties; Based on a systematic analysis of the microscale physics using the Lattice Boltzmann method. The small-scale dynamics

will be integrated into macroscale descriptions using stochastic theory. Incorporate stochastic analysis into the linear instability criteria developed by Wang et al. [1998] for the description of finger flow formation, propagation, and persistence in heterogeneous media. The end product will be used to evaluate the performance of various remediation techniques employed at DOE sites.

16. Post-doc Soil Physicist, Characterization of **Preferential flow in spatially variable unsaturated field soils** (PI: Dr. William A. Jury). BARD, The United States – Israel Binational Agricultural Research and Development Fund, 1998-2001. Dye tracing and multiple tracer experiments on undisturbed field plots to reveal information about the flow velocity, spatial prevalence, and time evolution of a preferential flow event. Numerical experiments to determine whether preferential flow observations are consistent with Richards' equation. Develop a flow model that incorporates preferential flow.
17. Post-doc Soil Physicist, **Sustainability of Long-term Reclaimed Wastewater Irrigated Cropland - A Field Evaluation of Soil Quality** (PI: Dr. Andrew Chang). The Kearney Foundation of Soil Science, 1998-2000. Field study for the effects of long term wastewater irrigation on soil's ability to sustain plant growth and to attenuate pollutants. Geostatistical analyses of soil physical, chemical and biological attributes to characterize soil qualities at two field sites outside the City of Bakersfield, CA. Development of integrated indicators of soil quality for assessment of soil and environmental degradation.
18. PI. **Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media**. Doctoral Full Scholarship and Research Fund, Bf720K/year, University of Leuven, Belgium, 1993-97. Experimental measurement and theoretical analyses of inter-displacement behaviors between air and an infiltrating liquid in unsaturated porous media; derivation of infiltration equations accounting for air entrapment effects; experimental study and theoretical prediction of unstable preferential flow in porous media.
19. PI. **Experimental and Numerical Simulation of Level Basin Irrigation Systems**, National Natural Science Foundation of China (NSFC 59209099), RMB¥50K, 1993-95. Theoretical and experimental study for the effect of air entrapment on water infiltration; Numerical modeling of the overland flow and subsurface infiltration hydraulics; optimization of system design variables based on soil and flow properties.
20. Co-PI. **Optimum Control of Flow in Irrigation Canal Systems** (PI: Dr. F. Zhu). Education Research Fund, Chinese Education Commission, RMB¥40K, 1990-92. Optimization of canal system operation and control regimes; Beneficial use of hyper-concentrated turbid flow; Development of a 0-1 programming model for optimal control of flow in irrigation canals.
21. Co-PI, **Water Control and Measurement Structures for Sediment-laden Flow** (PI: Dr. F. Zhu). Hydraulic Science Foundation, Water Resources Department of China, RMB¥30K, 1985-89. Development of Venturi type flowmeters and Flumes for discharge measurement in Trapezoidal and U-shaped open canals transporting sediment-laden flow.
22. Co-PI, **Utilization and Transportation of Hyper-concentrated Turbid Flow** (PI: Dr. F. Zhu). Hydraulic Science Foundation, Water Resources Department of China, RMB¥30K, 1986-89. Monitoring and prediction of floods in watersheds; Measurement of flow rate, sediment concentration and particle distribution; Transportation of turbid flow through canals; Fluid dynamics of turbid flow in canals and groundwater recharging fields.