Garry Raymond Willgoose

Work Address

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Birthdate

13 May 1958, Sydney, Australia

Citizenship

Australia

Education

1989 Doctor of Philosophy	Massachusetts Institute of Technology, USA. *A Physically Based Channel Network and Catchment Evolution Model* A model based on runoff and erosion physics to model the evolution of landscapes over geologic timescales and analysis of the implications of this model for the predictability of the hydrologic response of catchments.
1987 Master of Science	Massachusetts Institute of Technology, USA. *Automatic Calibration Strategies for Conceptual Rainfall-Runoff Models* A computer program to automatically calibrate a rainfall-runoff flood forecasting model to real-time rainfall and runoff data.
1981 Bachelor of Engineering in Civil Engineering (Honours Class I and University Medal)	University of Newcastle, Australia. Undergraduate thesis title *A sediment transport model for a 2-D turbulent open channel flow*: A computer model of the settling behaviour of particles in a turbulent flow, and the implications for sediment transport in rivers.
1981 Bachelor of Science	University of Newcastle, Australia**.** Major in Applied Mathematics.

Employment History

Professor	**2006-date**	*ARC Australian Professorial Fellow, School of Engineering, The University of Newcastle.*
Professor	**2003-2005**	*School of Geography, The University of Leeds.*
Associate Professor	**1999-2002**	*Department of Civil, Surveying and Environmental Engg, The University of Newcastle.*
Visiting Research Engineer	**2000**	*Department of Civil and Environmental Engg, Massachusetts Institute of Technology.*
Senior Lecturer	**1994-1998**	*Department of Civil, Surveying and Environmental Engg, The University of Newcastle.*
Visiting Scientist	**1997**	*National Institute for Water and Atmospheric Research, Christchurch, New Zealand.*
Visiting Research Associate	**1995**	*Institute for Environmental Science, University of Lancaster, UK.*
Lecturer	**1991-1993**	*Department of Civil, Surveying and Environmental Engg, University of Newcastle*
Australian Water Research Advisory Council Research Fellow	**1989-1991**	*Department of Civil, Surveying and Environmental Engg, The University of Newcastle.* Project *On the Understanding of Catchment Processes*. Further development of the SIBERIA model to minesite applications.
Research and Teaching Assistant	**1984-1989**	*Department of Civil and Environmental Engg, Massachusetts Institute of Technology.* Development of the SIBERIA as part of PhD.
Hydrologist	**1982-1984**	*Snowy Mountains Engineering Corporation (SMEC), Cooma.* Hydrologic modelling, data

		interpretation and associated reports for a range of projects in Australia and S.E.Asia..
Environmental Engineer	**1982**	*Croft and Associates, Newcastle*. Hydrologic investigations for Environmental Impact Statements.
Assistant Bridge Engineer	**1981**	*Bridge Design Section of Department of Main Roads (NSW).* Hydrologic and hydraulic designs for culverts and bridges
Engineering Trainee	**1976-1980**	*Department of Main Roads (NSW).* Summer jobs involving road, freeway and bridge, design and construction.
Tutor	**1980**	*Australian Development and Aid Bureau.* Tutoring of Samoan Civil Engineering students.

Awards and Peer Recognition

1997	Who's Who in Australia, Who's Who in Science.
1992	Lorenz Straub Award from St Anthony Falls Hydraulics Laboratory, University of Minnesota for best PhD submitted worldwide in hydraulics in 1989.
1989-1992	Australian Water Research Advisory Council Research Fellowship.
1987-1988	Arthur Ippen Fellowship.
1984-1989	Research Assistantship at the R.M. Parsons Laboratory for Water Resources and Environmental Engineering (MIT).
1980	University Medal, from University of Newcastle in Civil Engineering. James Hardie Award for Hydraulics. Newcastle Water Board Medal for excellence in water resources.
1979	BBR Award for Prestressed Concrete Design.
1976	BHP Award for Engineering Design.

Professional Memberships

Member, American Geophysical Union.
Member, Sigma Xi Scientific Research Society.

Professional Activities

Journal Editorial	Editorial Board of *Advances in Water Resources* (1997-2000). Associate Editor *Water Resources Research* (2002).
Journal Reviewer	*Advances in Water Resources, Catena , Earth Surface Processes and Landforms, Hydrological Processes, Journal of Geophysical Research, Journal of Rangeland Management, Journal of Hydrology, Reviews of Geophysics, Water Resources Research.*
Research Agency Reviewer	**Australia:** Australian Research Council (ARC); Technical Advisor for Australian Development and Aid Bureau (AusAid), (Flood forecasting on the Yangtze River, Hydrologic data collection for the lower Mekong River). **USA**: National Science Foundation; NASA; US Army. **UK**: NERC; EPSRC **The Netherlands:** Environment Research Agency.
Conference Organisation	**2004**: Geomorphology Committee, *European Geophysical Union Nice Meeting*. **1999**: Session Chair, *Fall Geophysical Union Meeting*, San Francisco, Special Session on Validation of Landform Evolution Modeling. **1996**: Session Chair, *Western Pacific Geophysical Union Meeting*, Brisbane, Special Session on Wetland Hydrology. **1996**: Session Chair, *Western Pacific Geophysical Union Meeting*, Brisbane, Special Session on Soil Moisture Estimation. **1993**: Organising committee for the Institution of Engineers Water Resources conference. **1995-date**: Scientific Advisory Boards for a number of international conferences.

Major Research Projects and Consultancies	**Total Research Funding**: more than AUST$6 million (about AUST$2.5 million as Chief Investigator), partner in two successful remote sensing supercomputing consortium proposals for AUST$2.2 million. Co-proponent and co-founder of Earth and Biosphere Research Institute at U. Leeds. **Total Consulting Funding**: about AUST$500,000 (mostly as part of university companies LandTech Landform Technologies and Telluric Research).
1989-1992	• Linkages between hydrology and catchment geomorphology (AWRAC).
1992-1997	• Postmining Landscapes and Water Quality (QCA, ACARP).
1992-1997	• Ranger mine rehabilitation (ERISS, ERA).
1992-1996	• Erosion-Rainfall simulator and SIBERIA testing (AWRAC, UNRMC, ARC).
1992-1993	• Computer time on VP 2200 for fractal analysis of natural and synthetic landforms (ANU).
1993-1996	• Experimental testing of a catchment evolution theory (ARC).
1994-1995	• Object-oriented ecosystems model for computer based teaching (CAUT).
1995-1997	• Spatial organisation in hydrology (ARC).
1995-1997	• Stability and risk assessment of engineered landforms (TUNRA, ARC).
1995-1998	• Tomago wetland management (Industry/APA, Tomago Aluminium).
1997-2000	• Long term weathering experiments and modeling of mine spoils (ARC, Northparkes Gold Mine, Hamersley Iron).
1997-2000	• Remote Sensing Travel Grant (DIST).
1997-2000	• Field testing of the SIBERIA model at Tin Camp Creek, Scinto 2 Mine and Ranger (***eriss***).
1996-1998	• Developing long stability guidelines for escarpment Waste Rock Dumps (Hamersley Iron).
1998-date	• Long term containment of nuclear waste at NW valley, NY (SAIC).
1998	• Rehabilitation Design, Argyle Diamond Mine (Coffey Consultants).
1998	• Research Needs for Tailings Management (AMIRA, ACMER).
2000-2002	• Validation of long term erosion predictions using old dumps at Mt Tom Price iron-ore mine (Hamersley Iron, Rio Tinto).
2000	• Design of geomorphic landforms for mine site rehabilitation and the effect of armouring in rocky spoils (Western Mining Corporation, Landloch Research Ltd).
2001-2003	• A physically based method for interpolation of soil properties (ARC).
2001-date	• Risk assessment of erosion predictions at Ranger and Jabiluka mines (***eriss***).
2002-2004	• Scaling and assimilation of soil moisture and streamflow, SASMAS (ARC).
2003-2005	• Earth and Biosphere Research Institute seed funding, (U. Leeds).
2004-2009	• Marie Curie Research Training Centre in “Ecology and Biodiversity”, (EU FP6).
2006-date	• TERRESIM: A new generation environmental modeling system, (ARC).

Post-Doctoral Fellows and Research Visitors

Dr Patricia Saco, post-doc, 2003-date
Dr Tony Wells, post-doc, 1999-date.
Dr Gregory Hancock, post-doc, 1997-1999.
Prof. Rafael Bras, Massachusetts Institute of Technology, 1998.
Dr Hemantha Perera, post-doc, 1998.
Dr Mukesh Desai, post-doc, 1998-date.
Dr Jia Ningyi, Chinese Academy of Science, 1994.
Dr. Yeboah Gyasi-Agyei, post-doc 1994-1997.
Mr. Hequing Huang, Chinese Academy of Science, 1992.

PhD Students

Completed

Saniya Sharmeen, PhD (2001), *Long term soil development on mine spoils*. Supervisor.
Jeff Walker, PhD (2000), *Remote sensing of soil moisture*. Supervisor.
Dene Moliere, ME (2000), *Hydrology of mine spoils*. Supervisor.
Cath Hughes, PhD (1999), *Wetland ecosystems hydrology management study*. Co-supervisor with Dr Philip Binning.
Ken Evans, PhD (1998), *Long term stability of engineered landforms*. Supervisor.
Hemantha Perera, PhD (1998), *Simplifying DTM based hydrology models using geomorphic insight*. Supervisor.
Greg Hancock, PhD (1997), *Rainfall-erosion simulator experiments to test theoretical relationships for hydrology-erosion-geomorphology linkages*. Supervisor.

Current

Sagy Cohen, (PhD, commenced 2006), *The interaction between geomorphology and soil genesis*. Co-Supervisor with Greg Hancock.
Herbert Hemakumar, (PhD, commenced 2002), *Scaling of soil moisture*. Co-Supervisors Jetse Kalma, Jeff Walker.
Christoph Rudiger, (PhD, commenced 2002), *Assimilation of river discharges into a distributed soil moisture and hydrology model*. Co-Supervisors Jeff Walker, Jetse Kalma.

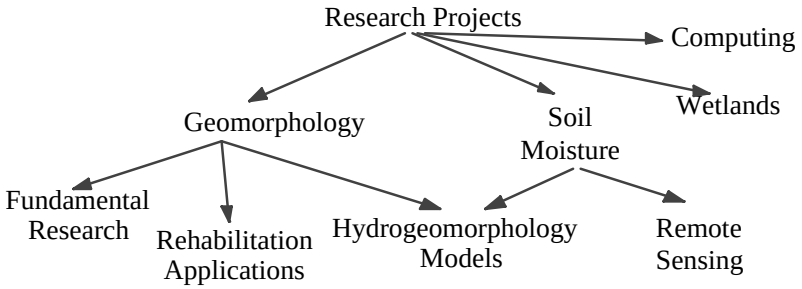
PhD Committees and External PhD Examinations

Ines Fonseca, Ph.D. (2005, Kings College London). *Using GIS and remote sensing for geomorphic analysis in southern Spain*. External PhD examiner.
Jo Clark, Ph.D. (2005, University of Leeds). *The sulphate and organic carbon geochemistry of peat land bogs in upland Yorkshire*. Internal PhD examiner.
Guy Boggs, Ph.D. (2003, Northern Territory University). *Erosion at the Jabiluka mine site*. External PhD examiner.
Brett Tuner, Ph.D. (2002, U. Newcastle). *In Situ Remediation of Fluoride contaminated groundwater*. Member of Ph.D. Supervisory committee.
Andrew Frost, PhD (2002, U Newcastle). *Climatic effects on extreme rainfall*. Member of PhD Supervisory committee.
Andrew Krause, PhD (2002 U Newcastle). *Erosion in the Williams River catchment*. Member of PhD Supervisory committee.
Glen Moglen, PhD (1994, MIT). *Geomorphic modelling of landforms*. Member of PhD Supervisory committee.

Research Interests

The focus of my research is in computational environmental dynamics, using process based models as numerical laboratories to better understand spatial and temporal variability in environmental processes.

There are four main initiatives: **Hydrogeomorphology, Soil Moisture, Wetlands** and **Computing**. Many of these problems are quite complex and require a broad range of skills. I see it as counterproductive to try to develop those skills in-house. I prefer to work with others who have complementary skills. These collaborators are in universities in Australia (U. Melbourne and ANU) and overseas (U. Glasgow; MIT, USA), government authorities in Australia (Environmental Research Institute of the Supervising Scientist) and overseas (US Dept of Agriculture; National Institute for Water and Atmospheric Research, NZ; NASA), and commercial organisations in Australia (Landloch, Metago) and overseas (Science Applications International Corporation, USA; Los Alamos National Laboratory).



Hydrogeomorphology: This program has been the original focus of my research and forms the core of many of my projects. The main emphasis has been the **fundamental research** program that has been aimed at understanding why landforms look the way they do. For instance, how do the runoff and erosion physics shape the landform and what can the landform shape (i.e. geomorphology) tell us about the physics that shaped it? Is it possible to "measure" the runoff and erosion simply by analysing the landforms? The main tool for doing this work has been the development the SIBERIA landform evolution computer that simulates the runoff and erosion on a landform and can simulate the evolution of that landform on the basis of that predicted erosion. My group has pioneered practical applications of landform evolution models, most notably for mine site rehabilitation and containment of nuclear waste over long timescales. This has involved pioneering techniques to calibrate them to observed runoff and erosion, predicting the evolution of actual landforms and quantitative testing of model predictions in the field and laboratory.

To achieve these practical applications has involved a range fundamental research projects looking at how the erosion rate of a minesite changes over time (up to 1000 years) due to armouring and weathering, and how landforms, soils and vegetation co-evolve. Our current work in the area is focused on developing and testing models for soil pedogenesis and vegetation pattern formation, and their natural self organisation may allow us to develop simple conceptual models of land-surface **ecohydrology** for inclusion in global climate models.

Soil Moisture: One of the major unknowns in flood hydrology is how wet a catchment is, or will be, before a rainfall event. Soil moisture varies dramatically in space and time and has in the past been difficult to measure. New developments in **remote sensing** from satellites and relatively inexpensive electronic measurement techniques promise to revolutionise flood prediction if we knew how to use the data in our models. My work has concentrated on using the remote sensing and ground instrumentation to estimate catchment average soil moisture by combining soil moisture physics and statistical techniques based on Kalman filtering, and validation of these estimates using ground truth data sets. Current work is focusing on our SASMAS soil moisture field site and studying this data for the patterns and temporal dynamics of soil moisture in semi-arid

and arid environments.

Soils Pedogenesis: In the complex distributed hydrology and erosion models discussed above it is generally assumed that the soil properties are the same everywhere. We know, however, that they are quite variable in space and strongly coupled with the spatial pattern of soil moisture. Yet there are no practical technologies to measure soil properties in sufficient detail. If we were able to model soil development, in the same way as SIBERIA can model landform evolution, then we could better understand how soils vary in space. and develop simple models for soil spatial properties. We have had some significant success in predicting spatial distribution of soil depth and spatial distribution of near surface soil grading. Current activities are further exploring spatial organisation and in collaboration U. Glasgow we are extending SIBERIA to model the transport of cosmogenic nuclide tracers.

Vegetation Self-Organisation: In hydrology vegetation effects are generally considered by using remote sensing data to determine species distribution and density, and then applying known species hydrology. We are beginning to understand that many important properties cannot be determined this way. For instance, rooting depth is known to impact on seasonal estimates of transpiration and cannot be estimated from remote sensing, yet it is a very important component of the land-atmosphere interaction in climate models. Our research group is currently focusing on modelling vegetation pattern development in arid areas. The ultimate aim is to develop a model that can predict changes in vegetation pattern and knock-on runoff capture so as to be able to assess the effect of climate change on runoff generation in our highly sensitive arid regions.

Computing: Many of the projects above involve complex computer models that require supercomputer resources to run. One landform simulation can easily take days on a high end workstation. For some time I have used innovative computational techniques to solve these problems. I have been actively involving in writing and using parallel computer codes using PVM, MPI-2 and openMP using a range of computing resources from multi-core workstations to Beowulf clusters and supercomputers. Current work is focused on the **Terresim project** which aims to develop a graphical DEM based environmental modelling framework that allows model assembly to be a non-programming task, which transparently supports GUI, GIS, visualisation and parallel computation in a multi-language and multi-site open-source collaboration framework, and which doesn’t require major recoding of existing models for incorporation.

Publications

Monographs

3. Evans K G, **Willgoose G R**, Saynor M T and House T. 1998. *Effect the vegetation and surface amelioration on simulated landform evolution of the post-mining landscape at ERA Ranger Mine. NT*, Supervising Scientist Report, The Environmental Research Institute of the Supervising Scientist, Australian Government Publishing Service, Canberra, 245p.
2. **Willgoose G R** and Riley S J. 1998. *Application of a catchment evolution model to the prediction of long term erosion on the spoil heap at Ranger Uranium Mines: Initial analysis*. Supervising Scientist Report, The Environmental Research Institute of the Supervising Scientist, Australian Government Publishing Service, Canberra, 128p.
1. Grayson R, Chiew F, Daniell T, Hadgraft R, Nathan R, Sivapalan M, Vertessy R, **Willgoose G R**, Wilson C, (1993), *The MYTH Report: Some ideas on the future of hydrology in Australia*. Centre for Environmental Applied Hydrology, University of Melbourne.

Book Chapters

5. **Willgoose G R**, Hancock G R and Kuczera G. 2003. A Framework for the Quantitative Testing of Landform Evolution Models, *Prediction in Geomorphology, Geophysical Monograph 135*, Iverson R and Wilcock P (Ed), American Geophysical Union, Washington, 195-216.
4. **Willgoose G R**. 2001. Erosion processes, catchment elevations and landform evolution modelling, *GBR 2000*, P Mosley (Ed), 507-530, The Hydrology Society of New Zealand.
3. Gyasi-Agyei Y, **Willgoose G R** and de Troch F P. 1995. Effects of vertical resolution and map scale of digital elevation maps on geomorphologic parameters used in hydrology, *Scale Processes in Hydrology and Environmental Modelling*, J Kalma and Sivapalan M (Ed), Wiley, Chichester, 121-140.
2. **Willgoose G R** and Kuczera G A. 1995. Estimation of sub-grid scale kinematic wave parameters for hillslopes, *Scale Processes in Hydrology and Environmental Modelling*, J Kalma and Sivapalan M (Ed), Wiley, Chichester, 227-240.
1. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1994. Hydrogeomorphology modelling with a physically based river basin evolution model, *Process Models and Theoretical Geomorphology*, Kirkby M J (Ed), Wiley, Chichester, 271-294.

Journal Papers

Invited

4. **Willgoose G R.** 2005. Mathematical Modeling of Whole-Landscape Evolution. *Annual Review of Earth and Planetary Sciences* **33**, 443-459.
3. **Willgoose G R**. 1997. A hydrodynamic particle tracking algorithm for simulating settling of sediment, *Mathematics and Computers in Simulation*, 43, 343-349.
2. Evans K G, Saynor M J, **Willgoose G R** and Unger C J. 1996. Landform erosion assessment, *Mining Environmental Management*, 4(4), 23-25.
1. **Willgoose G R**, Bras R L, Rodriguez-Iturbe I. 1992. The relationship between catchment and hillslope scales: Implications of a catchment evolution model, *Geomorphology*, 5, 21-37.

Contributed

47. Saco, P. M., **G. R. Willgoose**, and G. R. Hancock. 2006. Eco-geomorphology and Vegetation Patterns in Arid and Semi-Arid Regions. *Hydrology and Earth System Sciences*, in review.
46. Wells, T., **G. R. Willgoose**, and G. R. Hancock. 2006. Modelling weathering pathways and processes for salt induced fragmentation of quartz-chlorite schist. *Journal of Geophysical Research*, in review.
45. Saco, P. M., **G. R. Willgoose**, and G. R. Hancock. 2006. Spatial organization of soil depths using a landform evolution model. *Journal of Geophysical Research (Surface Processes)*, in press.

44. Sharmeen, S., and **G. R. Willgoose**. 2006. A one-dimensional model for simulating armouring and erosion on hillslopes. 2. Long-Term Erosion and Armouring Predictions for Two Contrasting Mine Spoils. *Earth Surface Processes and Landforms*, in press.
43. Walker, J. P., and **G. R. Willgoose**. 2006. Errors in digital elevation data generation. *International Journal of Photogrammetry and Remote Sensing*, in press.
42. Wells, T., P. Binning, **G. R. Willgoose**, and G. R. Hancock. 2006. Laboratory simulation of the salt weathering of schist: II. Fragmentation of fine schist particles. *Earth Surface Processes and Landforms*, in press.
41. Sharmeen, S., and **G. R. Willgoose**. 2006. The interaction between armouring and particle weathering for eroding landscapes. *Earth Surface Processes and Landforms* **31**:1195-1210.
40. Wells, T., P. Binning, and **G. R. Willgoose**. 2006. Laboratory simulation of the salt weathering of schist: I. Weathering of schist blocks in a seasonally wet tropical environment. *Earth Surface Processes and Landforms* **31**, 339-354.
39. **Willgoose, G. R.,** and S. Sharmeen. 2006. A one-dimensional model for simulating armouring and erosion on hillslopes. 1. Model development and event-scale dynamics. *Earth Surface Processes and Landforms* **31**:970-991.
38. Wells, T., P. Binning, and **G. R. Willgoose**. 2005. The role of moisture cycling in the weathering of a quartz chlorite schist in a tropical environment: findings of a laboratory simulation. *Earth Surface Processes and Landforms* **30**, 413-428.
37. Hancock, G. R. and **G. R. Willgoose**, 2004. An experimental and computer simulation study of erosion on a mine tailings dam wall. *Earth Surface Processes and Landforms*, **29,** 457-475.
36. Walker, J. P., P. R. Houser, and **G. R. Willgoose**, 2004. Active microwave remote sensing for soil moisture measurement: A field evaluation using ERS-2. *Hydrological Processes*, **18,** 1975-1997.
35. Walker, J. P., G. R. Willgoose, and J. D. Kalma. 2004. In-situ measurement of soil moisture: a comparison of techniques. *Journal of Hydrology* **293**:85-99.
34. Hancock, G. R., Loch R. J., and **Willgoose, G. R**. 2003. The design of post-mining landscapes using geomorphic principles. *Earth Surface Processes and Landforms*, 28, 1097-1110.
33. Hancock, G. R., and **Willgoose, G. R**. 2003. A qualitative and quantitative evaluation of experimental model catchment evolution. *Hydrological Processes*, 17, 2347-2363.
32. Walker, J. P., **Willgoose, G. R**., and Kalma, J. D. 2002. Three-dimensional soil moisture profile retrieval by assimilation of near surface measurements: Simplified Kalman Filter covariance forecasting and field application. *Water Resources Research*, 38, 1301.
31. Hancock, G. R., **Willgoose, G. R**., and Evans, K. G. 2002a. Testing of the SIBERIA landscape evolution model using the Tin Camp Creek, Northern Territory, Australia, field catchment. *Earth Surface Processes and Landforms* 27, 125-143.
30. Hancock, G. R., and **Willgoose, G. R**. 2002b. The use of a landscape simulator in the validation of the SIBERIA landscape evolution model: Transient landforms. *Earth Surface Processes and Landforms* 27, 1321-1334.
29. Hancock, G. R., and **Willgoose, G. R**. 2001. The use of a landscape simulator in the validation of the SIBERIA catchment evolution model: declining equilibrium landforms. *Water Resources Research* 37, 1981-1992.
28. Walker, J. P., **Willgoose, G. R**., and Kalma, J. D. 2001a. One-dimensional soil moisture profile retrieval by assimilation of near-surface measurements: A simplified soil moisture model and field application. *Journal of Hydrometeorology* 2, 356-373.
27. Walker, J. P., **Willgoose, G. R.,** and Kalma, J. D. 2001b. The Nerrigundah data set: Soil moisture patterns, soil characteristics and hydrological flux measurements. *Water Resources Research* 37, 2653-2658.
26. Hancock G. R., and **Willgoose G. R.** 2001. The production of digital terrain maps for experimental model landscapes. *Earth Surface Processes and Landforms* 26, 475-490.
25. Hughes C. E., Kalma J. D., Binning P., **Willgoose G. R**., and Vertonsis, M. 2001. Estimating evapotranspiration for a temperate salt marsh, Newcastle, Australia. *Hydrological Processes* 15, 957-975.
24. Walker J. P., **Willgoose G. R**., and Kalma, J. D. 2001. One-dimensional soil moisture profile retrieval by assimilation of near-surface observations: A comparison of retrieval algorithms. *Advances in Water Resources* 24, 631-650.
23. Hancock G R and **Willgoose G R**. 2001. The interaction between hydrology and geomorphology in a landscape simulator experiment. *Hydrological Processes*, 15(1), 115-133.
22. **Willgoose G R** and Perera H J. 2001. A simple model for saturation excess runoff generation using geomorphology, Steady-state soil moisture, *Water Resources Research*, 37(1), 147-156.
21. Evans K G, Saynor M J, **Willgoose G R**, and Riley S J. 2000. Post-mining landform evolution modelling. I. Derivation of sediment transport model and rainfall-runoff model parameters. *Earth Surface Processes and Landforms*, 25, 743-763.
20. Evans K G and **Willgoose G R**. 2000. Post-mining landform evolution modelling. II. Effects of vegetation and surface ripping. *Earth Surface Processes and Landforms*, 25, 803-823.
19. Hancock G R, Evans K G, **Willgoose G R**, Moliere D R, Saynor M J, and Loch R J. 2000. Medium term erosion simulation of an abandoned mine site using the SIBERIA landscape evolution model. *Australian Journal of Soil Research*, 38, 249-263.

18. Evans K G, Saynor M J and **Willgoose G R**. 1999. Changes in hydrology, sediment loss and microtopography of a vegetated mine waste rock dump impacted by fire, *Land Degradation and Rehabilitation*, 10, 507-522.
17. Walker J P and **Willgoose G R**. 1999. On the effect of DEM accuracy on hydrology and geomorphology models, *Water Resources Research*, 35(7), 2259-2268.
16. Western A W, Grayson R B, Bloschl G, **Willgoose G R** and McMahon T A. 1998. Observed spatial organization of soil moisture and relation to terrain indices, *Water Resources Research*, 35(3), 797-810.
15. Gyasi-Agyei Y and **Willgoose G R**. 1998. Generalisation of a hybrid model for point processes: Rainfall example, *Journal of Hydrology*, 219, 218-224.
14. Hughes C, Binning P and **Willgoose G R**. 1998. An experimental investigation and two-dimensional model of water balance and porewater movement in the intertidal zone of an estuarine wetland, *Journal of Hydrology*, 211, 4-49.
13. Perera H J and **Willgoose G R**. 1998. A physical explanation of the cumulative area diagram, *Water Resources Research*, 34(5), 1335-1344.
12. **Willgoose G R** and Hancock G R. 1998. Hypsometric curves as an indicator of catchment form: revisited, *Earth Surface Processes and Landforms*, 23, 611-623.
11. **Willgoose G R** and Riley S J. 1998. An assessment of the long-term erosional stability of a proposed mine rehabilitation, *Earth Surface Processes and Landforms*, 23, 237-259.
10. Gyasi-Agyei Y and **Willgoose G R**. 1997. A hybrid model for point rainfall modelling, *Water Resources Research*, 33(7), 1699-1706.
9. Evans K G, Saynor M J and **Willgoose G R**. 1996. The effect of vegetation on waste rock erosion, Ranger Uranium Mine, Northern Territory, *Bulletin of the Australian Institute of Mining and Metallurgy*, 6, 21-23.
8. **Willgoose G R**. 1994. A statistic for testing the elevation characteristics of landscape simulation models, *Journal of Geophysical Research*, 99(B7), 13987-13996.
7. **Willgoose G R**. 1994. A physical explanation for an observed area-slope-elevation relationship for declining catchments, *Water Resources Research*, 30(2), 151-159.
6. **Willgoose G R**. 1992. Environmental Engineering in the 1990s, *Environmental Newsletter* , 17(4), 1-2.
5. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1991. A physically based coupled network growth and hillslope evolution model: 1. Theory, *Water Resources Research*, 27(7), 1671-1684.
4. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1991. A physically based coupled network growth and hillslope evolution model: 2. Applications, *Water Resources Research*, 27(7), 1685-1696.
3. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1991. A physical explanation of an observed link area-slope relationship, *Water Resources Research*, 27(7), 1697-1702.
2. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1991. Catchment and hillslope evolution: New conceptualizations, *Earth Surface Processes and Landforms*, 16, 237-254.
1. **Willgoose G R**, Bras R L and Rodriguez-Iturbe I. 1990. A model of river basin evolution, *Trans. of American Geophysical Union*, 71(47), 1806 - 1807.

Conference Papers

Invited

11. **Willgoose G R**. 2000. Weathering, erosion and some examples of the implications for long term containment of tailings. *Mine Closure Workshop*. Perth, December 2000.
10. **Willgoose G R**. 2000. Erosion processes, catchment elevations and landform evolution modelling, *Gravel Bed Rivers 2000*, Christchurch, New Zealand, 28 August-2 September, 2000.
9. **Willgoose G R**. 2000. Geomorphology, erosion and long term containment of tailings. *Tailings-Corporate Risk and Responsibility*. Sydney, 15 March, 2000.
8. **Willgoose G R**. 1999. Geomorphology, erosion and issues for containment design. *Tailings-Corporate Risk and Responsibility*. Perth, 10 March, 1999.
7. **Willgoose G R**. 1998. Geomorphology and erosion. *Tailings-Corporate Risk and Responsibility*. Perth, 30 April-1 March, 1998.
6. Loch R J, So H B, Aspinall T O, Carroll C, **Willgoose G R** and Sheridan G. 1997. Post-mining landscape parameters for erosion control on coal mines, *Workshop on Post-Mining Landform Stability and Design*, Brisbane, Queensland, 18-20 September, 1996, 15-23.
5. Evans K G, Saynor M J, **Willgoose G R** and Unger C J. 1997. Erosion assessment for the post-mining landform at Ranger Uranium Mine, Northern Territory, *Workshop on Post-Mining Landform Stability and Design*, Brisbane, Queensland, 18-20 September, 1996.
4. **Willgoose G R** and Gyasi-Agyei Y. 1995. New technology in hydrology and erosion modelling for mine rehabilitation, *APCOM XXV Application of Computers and Operations Research in the Mineral Industries*, Brisbane, 10-12 July, 1995.

3. **Willgoose G R**. 1995. Latest developments in the design of mine rehabilitation, *Derelict and Contaminated Sites Symposium*, Department of Community Programs, The University of Newcastle, 1995.
2. Bell L C, Loch R J, Haneman D, and **Willgoose G R**. 1993. A Post-mining landform research program for open-cut mines, *AMIC Environmental Workshop*, October, 1993, Burnie, Tasmania.
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