

## CHRISTOPHER C. DUNCAN

GISmatters  
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### Domain Expertise

**GIS, Remote Sensing, Spatial Analysis, Data Visualization, Modeling, Simulation/Animation  
Database Development, Programming, Systems Integration, Training, Earth System Science**

### Computer Expertise

#### Applications

- GIS: ArcGIS 8.x/9.x, ARC/INFO, ArcView 3.x, GRASS, Google Earth Pro, Access
- Remote Sensing/Image Processing: ER Mapper, eCognition, ENVI, PCI, Imagine, PhotoShop
- Visualization: IBM Data Explorer/OpenDX, IDL, PV-WAVE, MATLAB, Excel
- PC/Mac: Excel, Access, Word, Powerpoint, CorelDraw, Canvas, PhotoShop, Illustrator, HyperCard

#### Programming Languages & Environments

- High-level: VB/VBA, C/C++, Java, JavaScript, Fortran, MPI, Pascal, FORTH, HyperTalk
- Application: Access, Word, Excel, ArcObjects, ARC/INFO AML, IDL, MATLAB, ERMapper
- Graphics/Visualization: OpenDX, IDL, PV-WAVE, HOOPS, CalComp, HPGL
- Operating systems: Unix programming/scripting (ksh, csh, and variants; sed/awk; Perl); VMS DCL
- Assembly: 8051, 80x86, 680x0, 6502

#### Operating Systems Administration

- Unix/Linux, Solaris, VMS, Windows 9x/2k/NT, Mac, MSDOS, others

#### Web

- HTML, CSS, DHTML, JavaScript, Java, CGI, GUI web editors

#### Hardware

- PC, Sun SPARC/Ultra, Mac, IBM SP/2 Parallel Supercomputer, DECstations/Alpha, others

### Conceptual/Analytical/Methodological Expertise

#### GIS & Spatial Analysis

- site selection, multi-criteria/constraint mapping, network/route analysis, raster modeling, Monte Carlo methods, error propagation, terrain analysis, hydro/watershed modeling, visibility analysis, database development, raster-to-vector, GPS integration, address geocoding, attribution, validation

#### Remote Sensing & Image Analysis

- supervised (e.g., MLE) & unsupervised (e.g., ISOCCLASS) classification, PCA/EOF, Fourier & wavelet methods, kernel/convolution filtering, data fusion, change detection, hyperspectral methods, feature extraction, geocoding/rectification, radiometric/atmospheric correction, terrain correction

#### Statistics/geostatistics

- analysis of variance, multivariate regression analysis, spatial pattern analysis, interpolation and prediction, kriging, spectral/timeseries analysis, cluster analysis, optimization methods

#### Visualization

- 2D/3D/more-D, plot/image/schematic, map-to-globe, swath profile, multi-surface, animation, more...

### Personal/Working Attributes

Inventive, quick-learning, versatile, integrative, tenacious, exacting, cooperative, independent, effective

### Education

PhD, Cornell University, Department of Geological Sciences, Ithaca, NY 1997

Major: *Earth System Science*      Minors: *Geomorphology, Atmospheric Sciences*

BA, Middlebury College, Middlebury, VT 1985

Major: *Geology and Physics*      Minor: *Art History*

## **Professional Work**

**GIS/Software/Scientific Consultant**, 1996-present (as founder/president of GIS*matters*, 2004-present)

### ***Federal & State Contracts***

- U.S. Department of State  
2005-6: perform multi-hazard risk assessments for landslides, marine and fluvial flooding, land subsidence, and coastal erosion at 250 State Department facilities worldwide
- U.S. Fish & Wildlife Service (Region 5)  
2006: extend automated document generation capabilities  
2005: extend Access database to Survey Division; enhance for release to other Regional Offices  
2004: convert 100+ mail-merge docs from WP to MSWord and integrate with database  
2003-4: develop integrated Access database for Realty Division acquisition tracking  
2001-2: develop ArcGIS Visual Basic application to automate standardized map production
- Massachusetts State Geologist Office, Amherst, MA  
2005: renew contract to digitize and attribute additional 27 surficial geology maps
- Massachusetts State Geologist Office, Amherst, MA  
2004: integrate, validate, map, and analyze multi-source well data for USGS StateMap project  
2004: develop GIS process and tools for producing FEMA Digital Flood Insurance Rate Maps  
2003: develop GIS process for semi-automated geologic map digitization and attribution
- Yukon Department of Environment, Whitehorse, Yukon, Canada  
2006: consultation and software development for custom spatial data adjustment project

### ***Commercial Clients***

- Atlas Exploration & Production LLC  
2006: Produce topographic, landsat, and geologic maps of prospective oil concession area
- Snowmobile Association of Massachusetts  
2006: Produce 12-page map booklet of GPS-based snowmobile trail routes
- Construction Insight, Inc.  
2006: Overhaul complex real estate valuation model in Excel; create multiple validation and reporting tools; create automated database update system from external sources
- Entertainment Publications, Inc.  
2006: Merchant distance/density analysis of 40 markets for new product (3 projects)  
2005: Determine 1500 optimal sales territories within 150 market regions based on market, demographic, business, and location data and constraints
- Museum Design Associates  
2005: Create 2 custom museum display maps for Amherst College Natural History Museum
- Electric Mobility, Inc.  
2005: Modeling of optimal sales territories for alternative business models (3 projects)  
2004: Determine 200-300 optimal nationwide sales territories based on market, demographic, location, travel-time, and sales data and constraints (2 projects)
- Centacare/Howell Spatial Industries (Australia)  
2005: Create GIS-based video animation of aerial fly-over of Mt. Everest trek
- Banyan Productions, Inc.  
2004: Provide field mapping support and GIS-based video animation of aerial fly-by of message cut into field for television program on The Learning Channel
- Shambhala Sun magazine,  
2003: produce annotated, false-color, shaded-relief map of Tibet
- Toxics Targeting, Inc., Ithaca, NY,  
1996-7: develop software, provide environmental consulting services for mapping toxic hazards
- Laurie Hart, Ithaca, NY,  
1997-8: produce regional and detail maps for textbook on French-Canadian fiddle music

### ***Academic Contracts***

- University of Massachusetts, Department of Geosciences, Amherst, MA  
2006-9: Develop custom scientific applications and data visualizations for Global Imagination's Magic Planet® spherical digital video globe

## **Professional Work (continued)**

### **GIS/Software/Scientific Consultant (continued)**

#### ***Academic Contracts (continued)***

- University of Massachusetts Medical Center, Worcester, MA  
2005-7: GIS/spatial analysis consultant on 2-year NIH-funded study of environmental factors involved in rising U.S. obesity prevalence
- Dr. Richard Little, Greenfield Community College  
2002: produce topography/watershed map with cross-section overlays for geology text
- Dr. Kerry Cook, Cornell University, Ithaca, NY,  
1997: devise methods for output, analysis & visualization of global climate model timeseries
- Prentice-Hall Publishers, Upper Saddle River, NJ,  
1996-7: develop web-based companion study guide for college-level earth science textbook

**Professor**, Department of Geosciences, University of Massachusetts, 1998-present (adjunct, 2004-present)

- **Research**: Tectonic/climatic geomorphology, climate change, natural hazards, numerical modeling, GIS, remote sensing/image processing, spatial analysis, geostatistics, visualization
- **Teaching**: Introduction to GIS, Advanced Modeling and Geostatistics with GIS, Remote Sensing Image Processing, Tectonic/Climatic Geomorphology

**Postdoctoral Researcher**, NSF CISE grant, Cornell Theory Center, 1997-1998

- spatio-temporal patterns of land-surface/climate interactions and climate change
- processing/analysis of terabyte-scale remote-sensing datasets on parallel supercomputer

**Program Manager**, Microsoft Corporation, Redmond, WA, 1990-1991

- devise, prototype and user-test Excel user interface features to improve product ease-of-use
- design, prototype and user-test introductory on-line tutorials

**Software Project Leader**, Medical & Scientific Enterprises, Sudbury, MA, 1988-1990

- hire and manage software development team for new robotic medical scanner
- design, assembly-program and document scanner embedded microcontrol system
- design, develop and document PC-based scanning/imaging software
- system testing, customer training and support, sales support

**Computer Consultant**, U.S.A. and U.K., 1987-1988

- design, develop and document customer service, book-keeping, and accounting software systems

**Physics/Earth Science Teacher**, Waynflete School, Portland, ME, 1986-1987

- 11th/12th grade physics; 7th grade earth science; 8th grade physical science

**Physical Science/Earth Science Teacher**, Landon School, Bethesda, MD, 1986

- 7th grade earth science and 9th grade physical science

**Technical Assistant**, Dewberry, Nealon, & Davis, Engineers, Vienna, VA, 1980-1981

- production of FEMA flood insurance rate maps; create technical procedures manual

## **Patent**

#5,685,001: Method and System for Automatically Entering a Data Series into Contiguous Cells of an Electronic Spreadsheet Program or the Like, Capson, B., Cherry, W., Devaan, J., Duncan, C., Fowkes, R., Graham, C., James, L., and McGuire, T. Jr., 1997

## **Selected Peer-reviewed Publications**

Duncan, C.C., Masek, J.G., and Fielding, E.J., 2003, How steep are the Himalaya? Characteristics and implications of along-strike topographic variations, *Geology*, 31, 75-78

### **Selected Peer-reviewed Publications (continued)**

- Diaz, H.F., Eischeid, J.K., Duncan, C.C., Bradley, R.S., 2003, Variability of freezing levels, melting season indicators, and snow cover for selected high-elevation and continental regions in the last 50 years, *Climatic Change*, 59, 33-52
- Duncan, C.C., Klein, A.J., Masek, J.G., and Isacks, B.L., 1998, Late Pleistocene and modern glaciations in central Nepal from digital elevation data and satellite imagery, *Quaternary Research*, 49, 241-254
- Masek, J.G. and Duncan, C.C., 1998, Minimum-work mountain building, *J. Geophys. Res.*, 103, 907-917
- Burbank, D.W., Leland, J., Fielding, E.J., Anderson, R.S., Brozovic, N., Reid, M.R., and Duncan, C.C., 1996, Bedrock incision, rock uplift, and threshold hillslopes in the northwestern Himalayas, *Nature*, 379, 505-510
- Duncan, C.C. and Turcotte, D.L., 1994, On the breakup and coalescence of continents, *Geology*, 22, 103-6
- Fielding, E.J., Isacks, B.L., Barazangi, M., Duncan, C.C., 1994, How flat is Tibet?, *Geology*, 22, 163-7

### **Grants, Honors, and Awards**

- Nominated for Distinguished Teaching Award, 2001
- Lilly Teaching Fellowship, 2000-2001
- NASA Research Grant, "Assessing landforms and land surface change in active mountains with SRTM and ENVISAT observations and numerical modeling", \$200,000, 1999
- European Space Agency Data Grant, "Assessment of natural and human-induced landslides in mountainous regions from ASAR and MERIS observations", 1998
- NASA Space Grant Graduate Fellowship, 1992-93, 1993-94, 1994-95
- National Science Foundation Graduate Fellowship Honorable Mention, 1992
- Cornell University Department of Geological Sciences McMullen Fellowship, 1991-92
- Graduated with Honors in Geology, Middlebury College, 1985

### **Field Work and Foreign Travel**

- Taiwan, 2003: GSA Penrose conference on Tectonics, Climate and Landscape Evolution
- Bhutan, 2002: organized and led geomorphology research and sample collection expedition
- Bhutan, 1999: co-organized geology/geomorphology research and sample collection expedition
- Italy, 1997: Himalaya-Karakoram-Tibet International Workshop
- Nepal, 1995: IGBP-PAGES International Himalayan/Tibetan Plateau Paleoclimate Workshop
- Vermont, 1984: conducted gravity and magnetic survey of Champlain Valley
- Personal: Canada, Alaska, England, Scotland, Wales, Ireland, France, Germany, Austria, Italy, Spain, Costa Rica, Peru, Morocco, Myanmar, Thailand

### **Graduate Student Committees and Students Taught, 1998-2004**

Ph.D.:	6	Introductory GIS:	75
Masters:	7	Advanced GIS:	75
Other:	4	Remote Sensing:	55
Independent Study:	15	Tect/clim Geomorph:	10

### **Memberships**

- American Geophysical Union
- Geological Society of America
- Association of American Geographers
- American Association for the Advancement of Science