The Environmental Fluid Mechanics and Water Resources program at the Georgia Institute of Technology focuses on water, atmosphere and land systems, with emphasis on the science and engineering applications of hydroclimatology, environmental transport processes and integrated resource management. The program's mission is to educate scientists and engineers through well-integrated and stimulating courses; create new knowledge through innovative experimental, computational and modeling research; and develop new technologies and tools that benefit engineering practice in fluid mechanics, hydraulics, hydrology, hydroclimatology, wave mechanics, ocean and coastal engineering, and water resources.

### RESEARCH AREAS

Research is supported by federal, state, and international agencies including the National Science Foundation, Georgia Department of Transportation, Agency for International Development, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, Environmental Protection Agency, United States Geological Survey, Office of Naval Research, and World Bank.

**Hydroclimatoloy and Water Resources** research focuses on terrestrial and atmospheric water/energy processes and fluxes; vegetation dynamics and decision support systems promoting holistic, equitable, and sustainable water use. Projects include:

- Remote sensing of hydrologic variables
- Atmospheric, surface and subsurface models
- Flood/drought forecasting and management
- Decision support systems for water resources assessment, planning and operation
- Climate change and impact assessments

**Environmental Fluid Mechanics and Hydraulic Engineering** research focuses on turbulent entrainment, transport, and mixing processes in natural and engineered environments. Projects include:

- Sediment transport and bridge scour
- Wastewater dispersion in coastal waters
- Cohesive sediment resuspension
- Flood hydraulics and river restoration
- Biological and ecological flows
- Hyporheic exchange in streams
- Hydrodynamics in UV and ozone reactors

**Coastal and Ocean Engineering** research focuses on waves, currents and transport from the ocean to the intertidal zone. Projects include:

- Water waves generated by winds, landslide, avalanche, or earthquake
- Marine hydrokinetic energy
- Circulation and transport in estuaries, rivers, and lakes
- Rogue waves, wave climate and extremes
- Ocean modeling

### SELECTED COURSES

- Fate of Contaminants
- Physical Hydrology
- Probability and Statistics for Civil and Environmental Engineers
- Stochastic Hydrology
- Water Resources Management
- Fluid Mechanics
- Random Fields and Geostatistics
- Environmental Fluid Mechanics
- Advanced Environmental Fluid Mechanics
- Fluid Mechanics of Organisms
- Flow through Porous Media
- Open Channel Hydraulics
- Sediment Transport
- Hydrodynamic Stability and Turbulence
- Linear Wave Mechanics
- Nonlinear Wave Mechanics
- Nearshore Hydrodynamics
- Coastal Sediment Transport
- Coastal Engineering Measurements
- Coastal Structures
- Coastal Hazards
- Computational Fluid Mechanics

### FACILITIES

Research and teaching are supported by state-of-the-art experimental, computational and data-acquisition facilities.

The Environmental Fluid Mechanics Laboratory includes a large constant-head tank, a 4.3-meter wide sediment scour flume, a 24-meter long tilting flume, a recirculating flume for cohesive sediment resuspension, a recirculating saltwater flume, and a density-stratified towing tank. Each of the flumes is also equipped with cutting-edge instrumentation, including ADV's, 3D LIF and PIV.
RAFAEL L. BRAS, SC.D. PROVOST AND EXECUTIVE VICE PRESIDENT FOR ACADEMIC AFFAIRS, K. HARRISON BROWN FAMILY CHAIR
Biophysical processes (radiation, heat fluxes, and evapotranspiration), hydrological processes; biochemical processes and vegetation dynamics; and complex and self-organizing systems.

FRANCESCO FEDELE, PH.D. ASSOCIATE PROFESSOR
Nonlinear water waves; rogue waves; oceanic turbulence; probability and statistics of nonlinear random wave fields; image processing for coastal and ocean engineering; compressive sensing via active surfaces.

HERMANN M. FRITZ, PH.D. ASSOCIATE PROFESSOR
Coastal hazards; tsunamis and hurricane storm surges; subaerial and submarine landslides; hydropower and marine renewable energy; hydraulic and coastal structures; laser measurement techniques; numerical simulation of multiphase flows; natural hazard mitigation and risk analysis.

ARIS P. GEORGAKAKOS, PH.D. DIRECTOR, GEORGIA WATER RESOURCES INSTITUTE & PROFESSOR
Remote sensing of hydrologic variables; flood and drought management; hydrothermal scheduling; agricultural planning; decision support systems for river basin planning, management, and climate change impact assessments.

KEVIN HAAS, PH.D. ASSOCIATE PROFESSOR & GROUP COORDINATOR
Coastal engineering; numerical modeling and video observations of near-shore processes; coastal morphodynamics; sediment and contaminant transport in tidal marshes; hydrodynamics of tidal creeks; marine hydrokinetic energy.

JIAN LUO, PH.D. ASSOCIATE PROFESSOR
Groundwater contamination and remediation; reactive transport in porous and fractured media; water resources management and policy; stochastic hydrogeology; geostatistics; linear and nonlinear systems; inverse modeling.

PHILIP J. ROBERTS, PH.D., P.E. PROFESSOR
Environmental fluid mechanics; mixing and dynamics of rivers, lakes, coastal waters, and estuaries; outfalls for wastewater discharge; mathematical models of wastewater fate and transport; oceanographic field programs and data interpretation.

TERRY STURM, PH.D., P.E. PROFESSOR
Hydraulic engineering; open channel flow resistance; compound channel hydraulics; sediment transport; scour around bridge abutments; cohesive sediment resuspension.

JINGFENG WANG, SC.D. ASSOCIATE PROFESSOR
Water-energy-carbon cycles, evapotranspiration, remote sensing of land-ocean-atmosphere processes, Bayesian probability and statistics.

DONALD WEBSTER, PH.D., P.E. ASSOCIATE CHAIR & PROFESSOR
Fluid mechanics; turbulence; turbulent and chaotic mixing; biological, ecological, and environmental flow applications; experimental methods.

RESEARCH FACULTY
MARTIN KISTENMACHER, PH.D. RESEARCH ENGINEER

ADJUNCT FACULTY
PAUL A. WORK, PH.D., P.E.