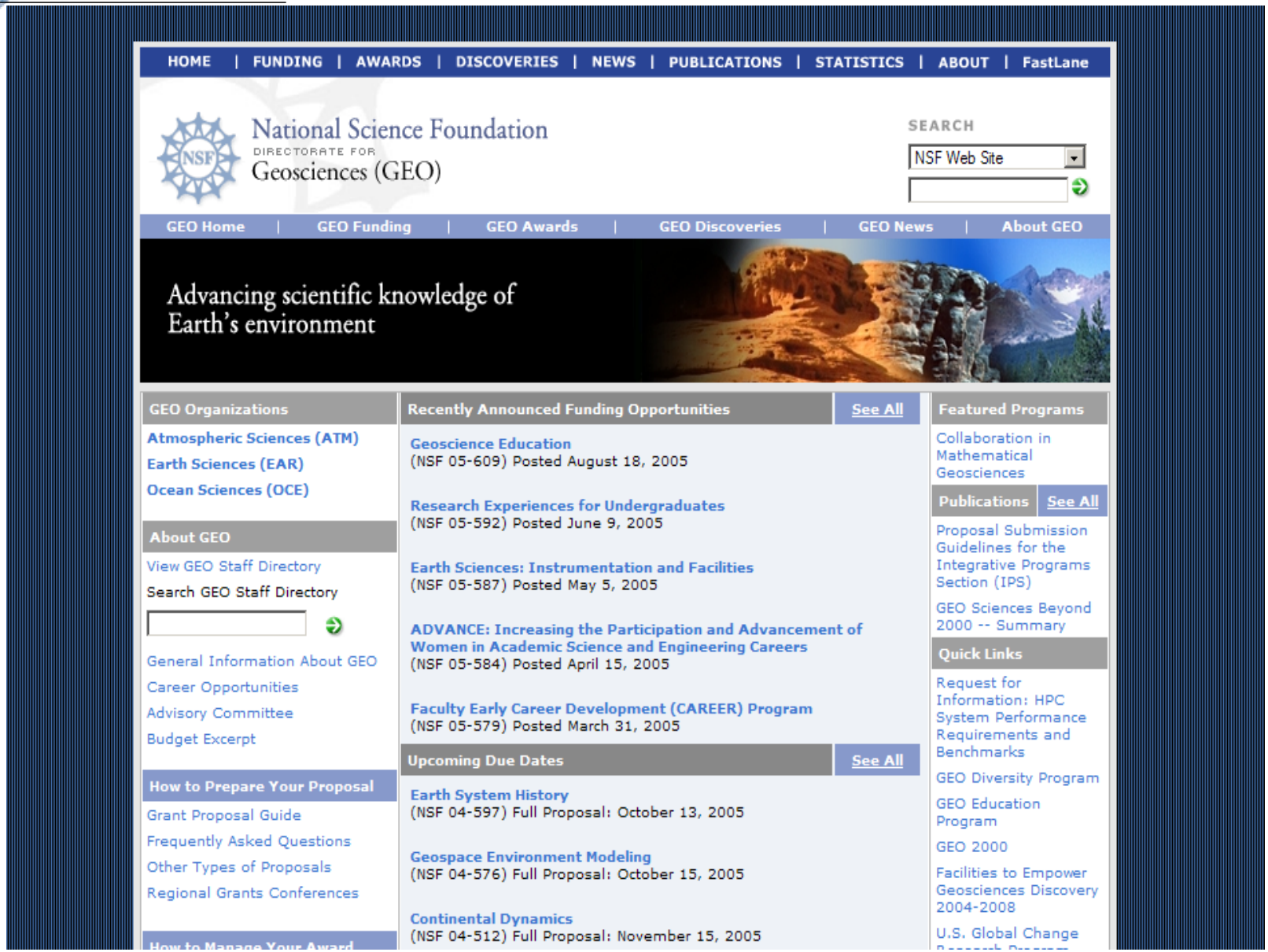
Directorate for Geosciences

Tampa, FL October 10, 2005

Jarvis L. Moyers
Division of
Atmospheric Sciences



http://www.nsf.gov/dir/index.jsp?org=GEO

Directorate for Geosciences (GEO)

- supports research in the atmospheric, earth, and ocean sciences
  - advances scientific knowledge of Earth's environment, including resources such as water, energy, minerals, and biological diversity
- principal source of federal funding for university-based fundamental research in the geosciences
- addresses nation's need to understand, predict, and respond to environmental events and changes, and to use Earth's resources wisely
  - advances ability to predict natural phenomena of economic and human significance, such as climate changes, weather, earthquakes, fish-stock fluctuations, and disruptive events in the solar-terrestrial environment

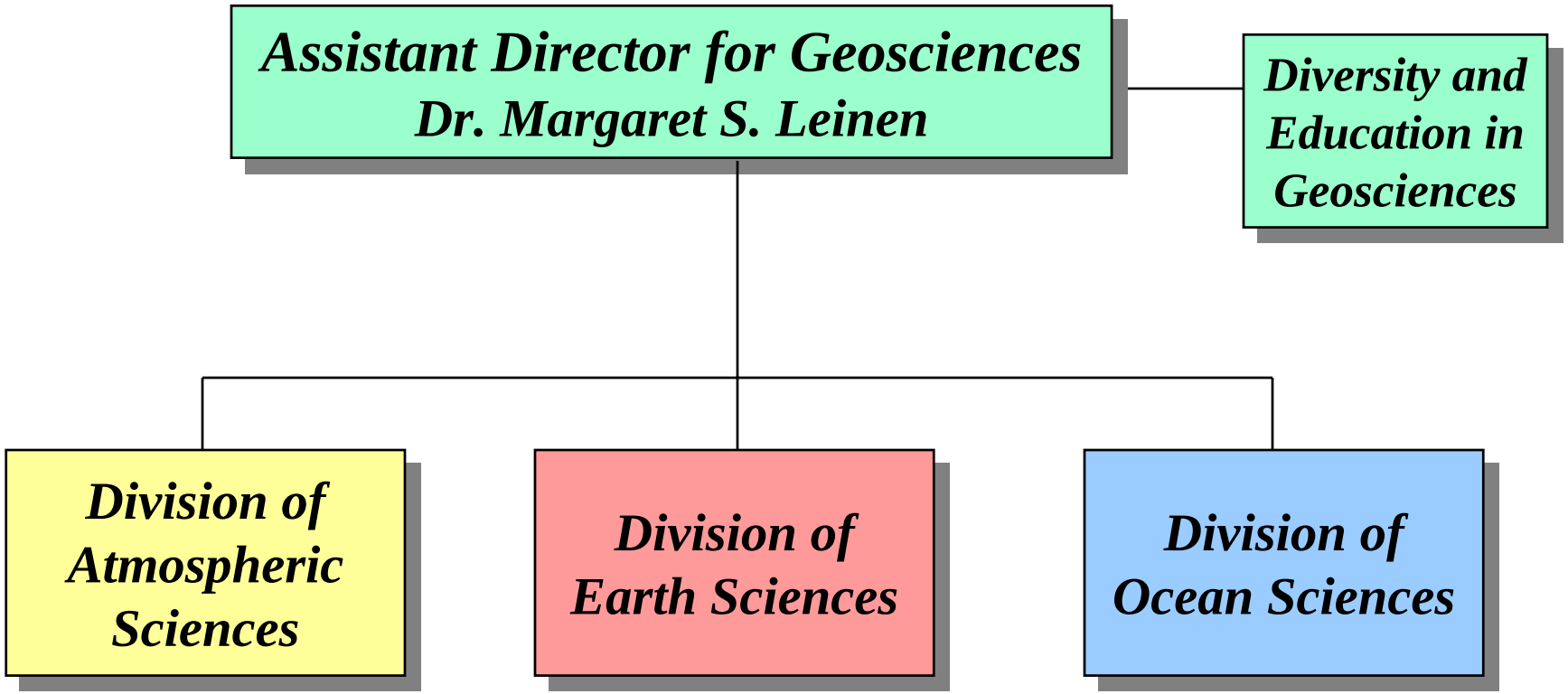
The Directorate for Geosciences

- invites unsolicited proposals from all scientists with interests in the geosciences
- sponsors special competitions, often interdisciplinary, in areas identified by the community as deserving special attention
- provides long-term support for shared resources
- seeks to promote collaborations with scientists in other disciplines, funding agencies, and Nations
- seeks to promote the integration of research and education

The Directorate for Geosciences supports

- individual investigator-initiated research projects
- investigator-initiated collaborative research programs
- shared resources
  - observational platforms
  - analytic facilities
  - computational facilities
- projects that foster education and training of the next generation of geoscientists

Directorate for Geosciences



GEO Budgets

GEO Budget Breakdown in Millions of Dollars	FY 2004 Actual	FY 2005 Current Plan	FY 2006 Request
Atmospheric Sciences	**$238.40**	**$233.43**	**$239.79**
Atmospheric Sciences Research Support	*156.65*	*153.38*	*158.69*
National Center for Atmospheric Research	*81.75*	*80.05*	*81.10*
Earth Sciences	**$152.03**	**$148.96**	**$154.07**
Earth Sciences Project Support	*119.75*	*115.19*	*119.73*
Instrumentation and Facilities	*32.28*	*33.77*	*34.34*
Ocean Sciences	**$322.98**	**$311.77**	**$315.24**
Ocean Section	*120.35*	*115.98*	*117.28*
Integrative Programs Section	*118.40*	*113.70*	*114.97*
Marine Geosciences Section	*84.23*	*82.09*	*82.99*
Total, GEO	**$713.41**	**$694.16**	**$709.10**

NSF Geosciences Beyond 2000

The Directorate for Geosciences, with input from the Advisory Committee for Geosciences and the broader research community, prepares long-range plans.

- *NSF Geosciences Beyond 2000: Understanding and Predicting Earth's Environment and Habitability* can be found at http://www.nsf.gov/geo/adgeo/geo2000.jsp

- *Facilities to Empower Geosciences Discovery 2004-2008* can be found at http://www.nsf.gov/geo/facilities/

Cross-Cutting Activities in GEO

- A program integrating three areas is in development for FY 06:
  - Biogeosciences
  - Integrated Carbon Cycle
  - Water Cycle

- Ecology of Infectious Diseases
  - Contact: Don Rice (drice@nsf.gov)
  - Joint Program Solicitation issued by NIEHS – annual competition

Mathematical Sciences

Collaborations in Mathematical Geosciences (CMG)

Joint GEO/MPS activity (NSF 05-535)

Deadline Date: February 1, 2006

GEO Contacts:

Steve Meacham (ATM) smeacham@nsf.gov

Robin Reichlin (EAR) rreichli@nsf.gov

Eric Itsweire (OCE) eitsweir@nsf.gov

GEO Diversity and Education

- education and diversity are critical in promoting the overall health of the geoscience enterprise
- GEO's commitment extends beyond providing support for the training of graduate students
- GEO supports quality geoscience education at all levels, including active outreach to the public
- GEO offers several programs to address diversity and education activities within the geosciences including
  - Geoscience Education (GeoEd)
  - Opportunities for Enhancing Diversity in the Geosciences (OEDG)

Geosciences DIRECTORATE FOR

Geoscience Education (GeoEd)

- supports projects that will:
  - pilot or initiate innovative geoscience education activities; or
  - integrate geoscience research and education activities into existing Louis Stokes Alliances for Minority Participation (LSAMP), Alliances for Graduate Education and the Professoriate (AGEP), and/or Centers of Research Excellence in Science and Technology (CREST) projects

- NSF 04-590 (due dates in Fall, 2005 and Fall, 2007)

Opportunities for Enhancing Diversity in the Geosciences (OEDG)

- primary goal is to increase participation in geoscience education and research by students from groups currently underrepresented in science, technology, engineering, and mathematics
- NSF 04-590 (next due date is in Fall, 2006)
- Contact Jackie Huntoon: 703.292.8500 or jhuntoon@nsf.gov

GEO Education Contacts

- Directorate-wide programs to fund formal and informal geoscience education activities (GeoEd)

  Contact: Jackie Huntoon (jhuntoon@nsf.gov)

- Division of Atmospheric Sciences

  Contact: Robert Kerr (rkerr@nsf.gov)

- Division of Earth Sciences

  Contact: Mike Mayhew (mmayhew@nsf.gov)

- Division of Ocean Sciences

  including Centers for Ocean Science Education Excellence (COSEE)

  Contact: Lisa Rom (erom@nsf.gov)

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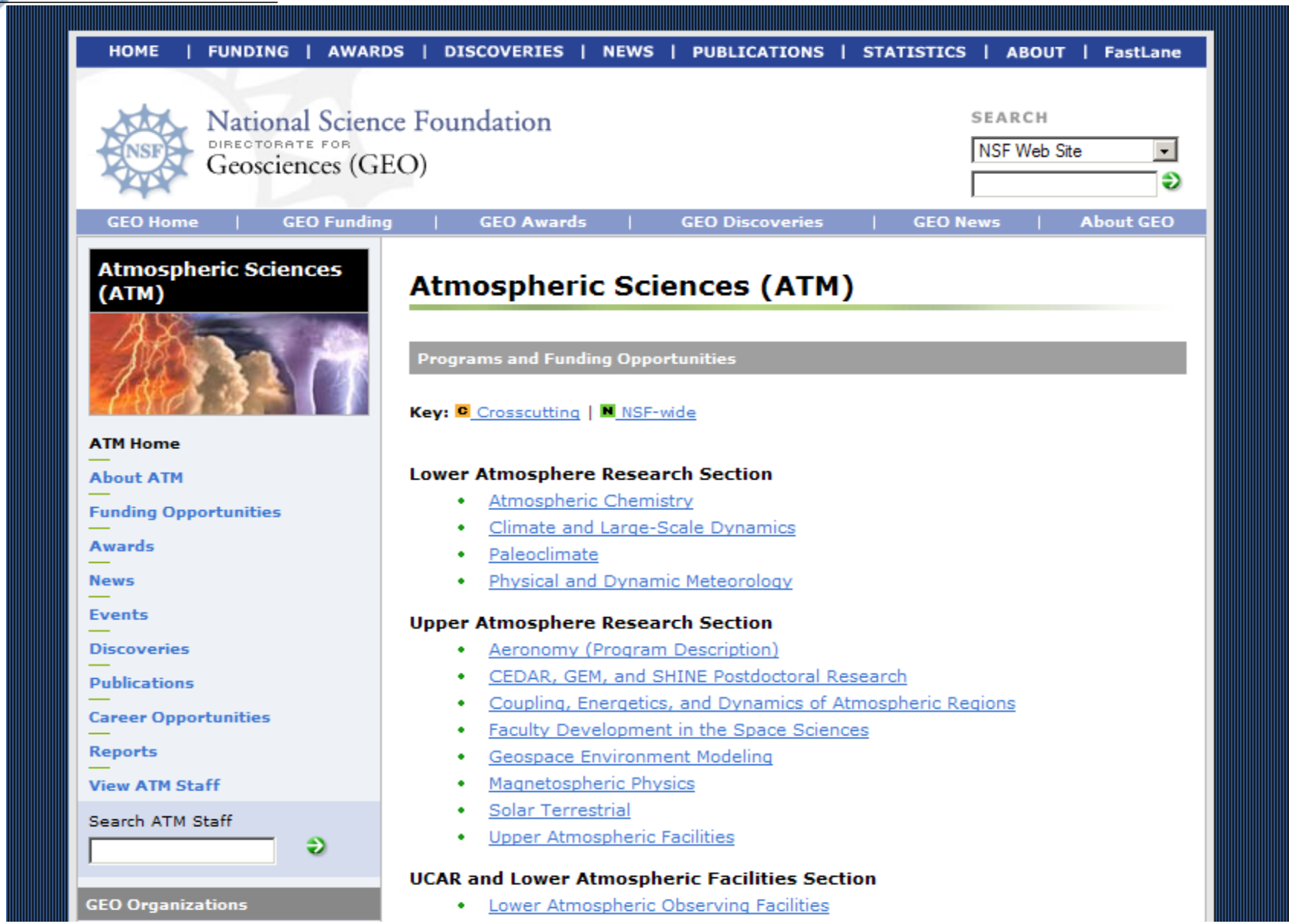
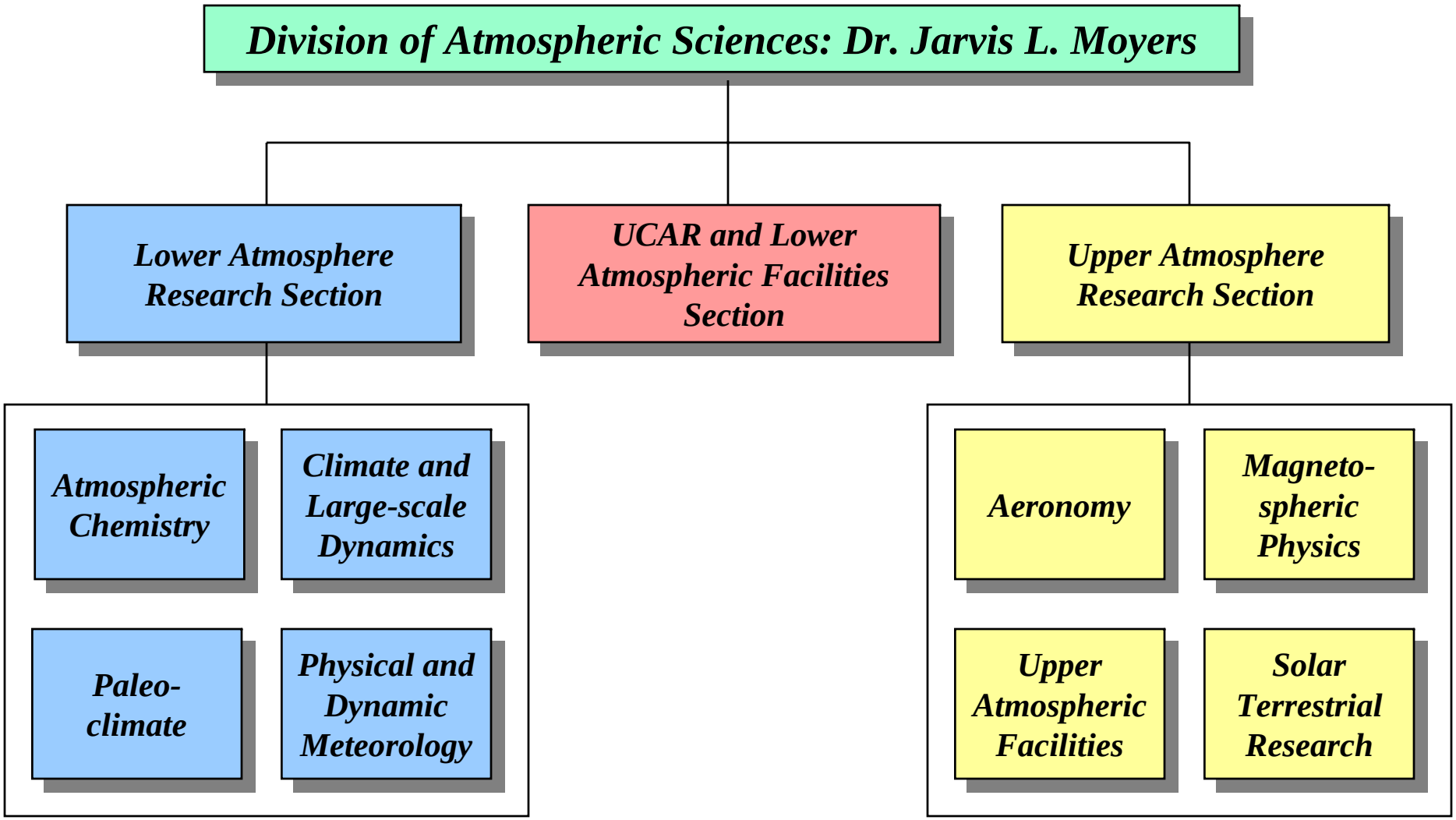


http://www.nsf.gov/div/index.jsp?div=ATM

Division of Atmospheric Sciences (ATM)

- furthers understanding of weather, climate and the solar-terrestrial system by expanding the fundamental knowledge of the composition and dynamics of the Earth's atmosphere and geospace environment, including:
  - studies of the physics, chemistry, and dynamics of earth's upper and lower atmosphere and its space environment
  - research on climate processes and variations
  - studies to understand the natural global cycles of gases and particles in earth's atmosphere
- supports large, complex facilities required for research in the atmospheric and solar-terrestrial sciences


Division of Atmospheric Sciences: Dr. Jarvis L. Moyers
Lower Atmosphere Research Section
UCAR and Lower Atmospheric Facilities Section
Upper Atmosphere Research Section
Atmospheric Chemistry
Climate and Large-scale Dynamics
Paleo-climate
Physical and Dynamic Meteorology
Aeronomy
Magneto-spheric Physics
Upper Atmospheric Facilities
Solar Terrestrial Research

*MRE & FC: HIAPER (*High-performance Instrumented Airborne Platform for Environmental Research)

- *new* platform will enable new types of research missions for atmospheric and environmental sciences

- Primary capabilities include operations at 50,000 feet, > 6000 pound payload, 10 hour duration, 6K naut. mile range

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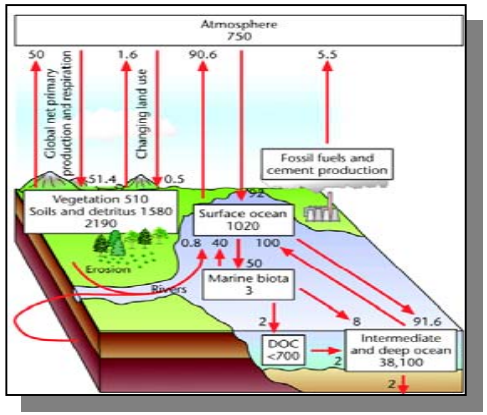
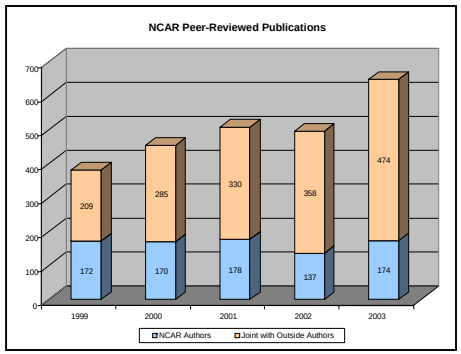
NCAR Responsibilities





- **Provide facilities, services, and intellectual commons for the atmospheric and related sciences research and education communities**
- **Lead the community in addressing complex large-scale problems**

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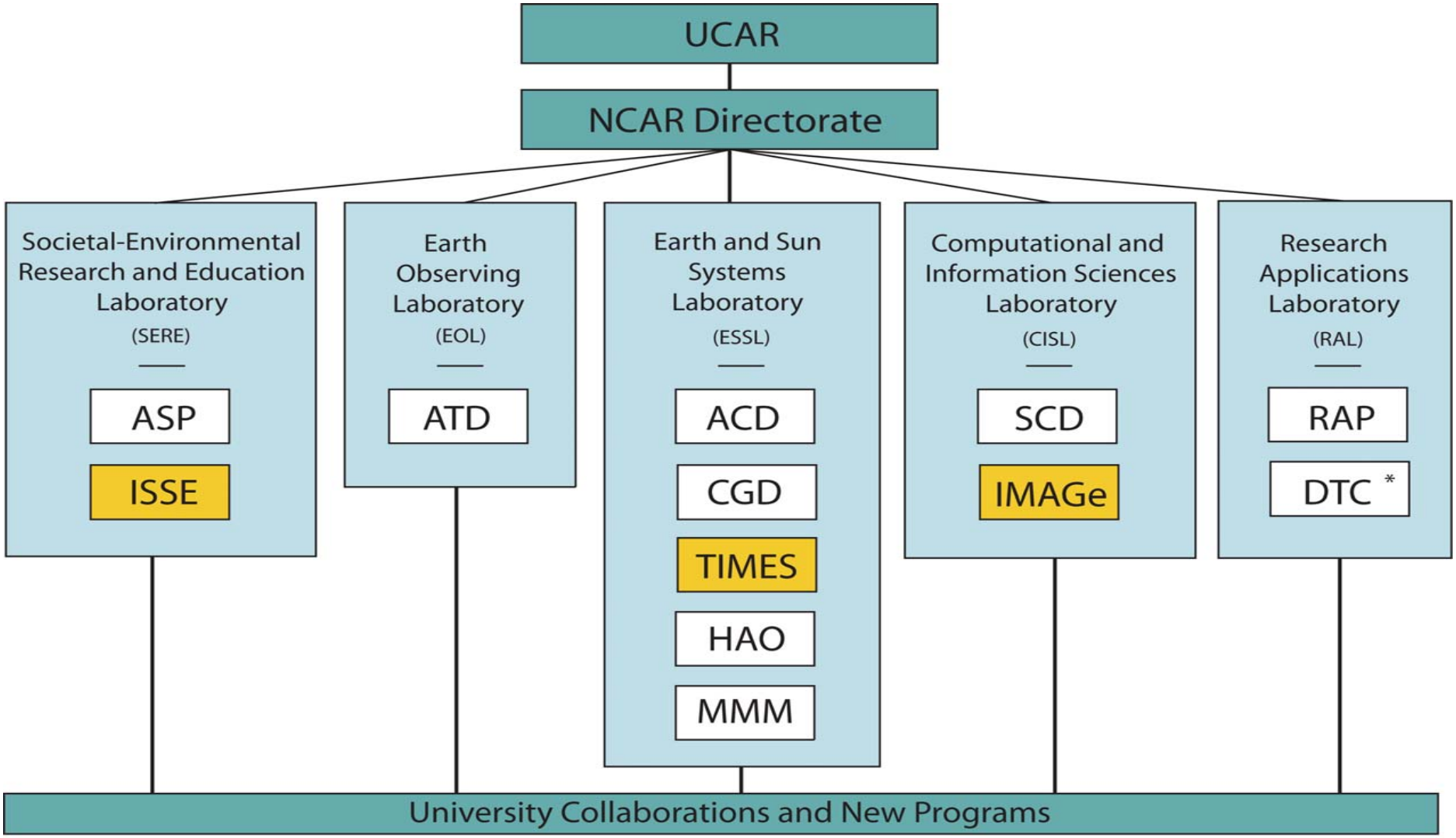

New Institutes

ISSE - Institute for the Study of Society and Environment
TIMES - The Institute for Multidisciplinary Earth Studies
IMAGe - Institute for Math in Geosciences

* DTC - Developmental Testbed Center

SOARS®

Bringing ethnically diverse undergraduate students into careers in the atmospheric and related sciences.

The Presidential Award for
Excellence in Science, Mathematics,
and Engineering Mentoring
is presented with the gratitude
of your fellow citizens by
The President of the
United States of America
to

Significant Opportunities in Atmospheric Research and Science

University Corporation for Atmospheric Research

for embodying excellence in mentoring underrepresented students and encouraging their significant achievement in science, mathematics, and engineering.

THE WHITE HOUSE
DECEMBER 2001

Significant Opportunities in Atmospheric Research and Science

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NSF Sponsored Lower Atmospheric Observing Facilities

Facility Type	Facility	Facility Manager
Aircraft	C-130Q	NCAR/ATD
	HIAPER	
	KA B200T	Univ. of Wyo.
Ground Based Systems	ISS (4)	NCAR ATD
	Class (5)	
	PAM III (3)	
Radars	S-POL	NCAR ATD
	ELDORA	
	CHILL	Colorado State U.
Airborne Sounding Systems	L2D2	NCAR/ATD
	L0D2	
	GPSDS	
Large Airborne Instruments	SABL	NCAR ATD
	AIMR	
	CVI	
	MASP	
	95 GHz Radar	Univ. of Wyo.

FIGURE 1.

Advanced Modular Incoherent Scatter Radar (AMISR)

- state-of-the art incoherent scatter radar deployable to any geographic location on the globe
- high spatial and temporal resolution
- each face can be separately located
- easy maintenance
- measures composition, temperature density and motion of upper atmosphere

Objectives

- Investigate deep polar cap ionosphere-thermosphere processes never studied before;
- Understand the coupling between the high-latitude neutral upper atmosphere and the high-speed, current carrying plasma in the auroral oval;
- Provide detailed ground-based observations needed for a wide range of spaceflight, data assimilation and theory/modeling projects

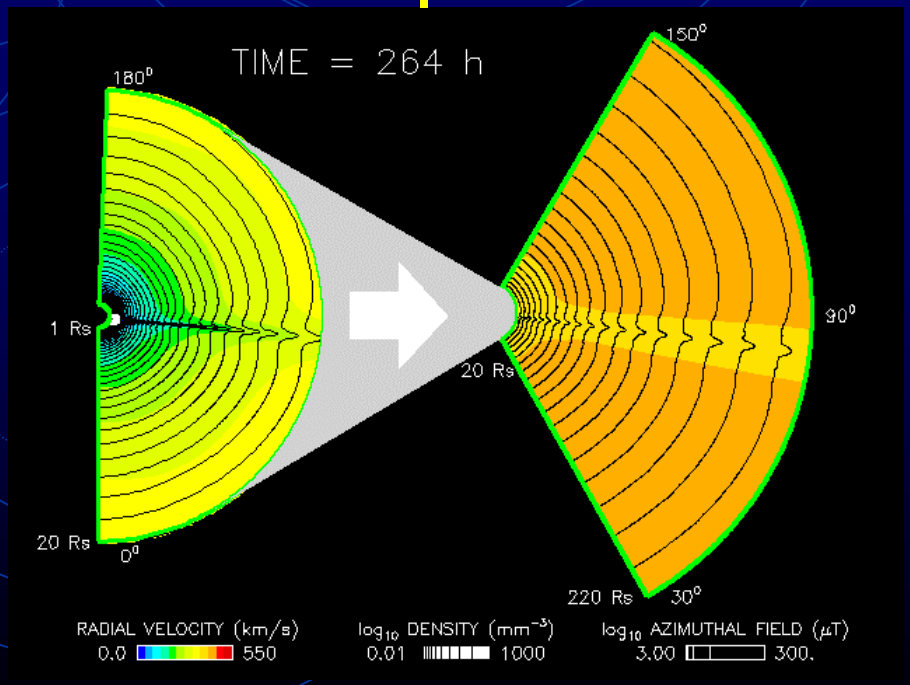
CISM

Center for Integrated Space Weather Modelling

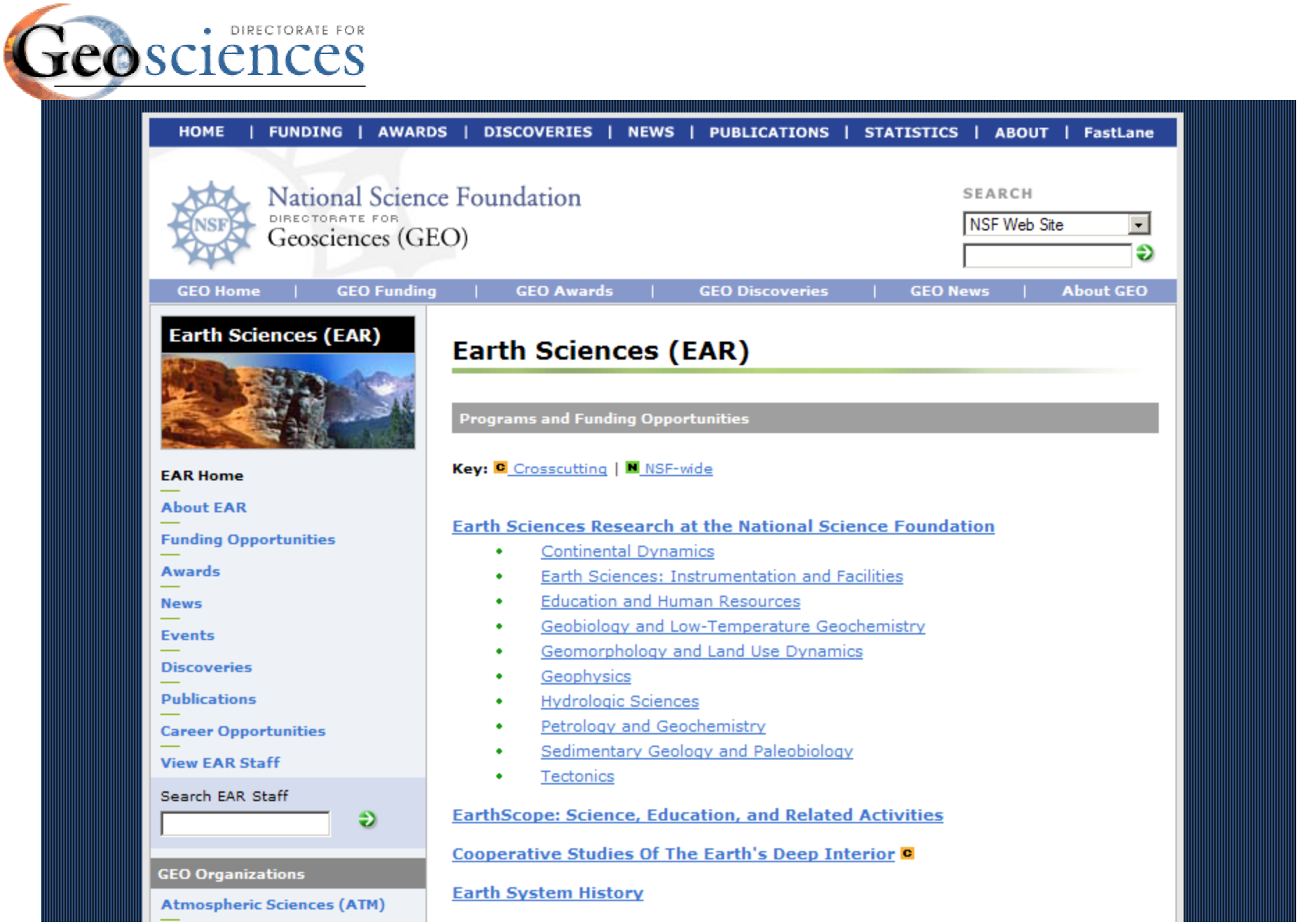
Education and Diversity

Knowledge Transfer

Space Weather Research and Model Development



An NSF Science and Technology Center



http://www.nsf.gov/div/index.jsp?div=EAR

Division of Earth Sciences (EAR)

- supports research to understand the structure, composition, and evolution of the Earth and the processes that govern the formation and behavior of the Earth's materials, including:
  - research to gain a better understanding of the Earth's changing environments, and the natural distribution of its mineral, water, and energy resources
  - methods for predicting and mitigating the effects of geologic hazards such as earthquakes, volcanic eruptions, floods, and landslides
  - dynamic modeling of earth system processes
- supports theoretical, computational, laboratories and field stations, and state-of-the-art scientific infrastructure

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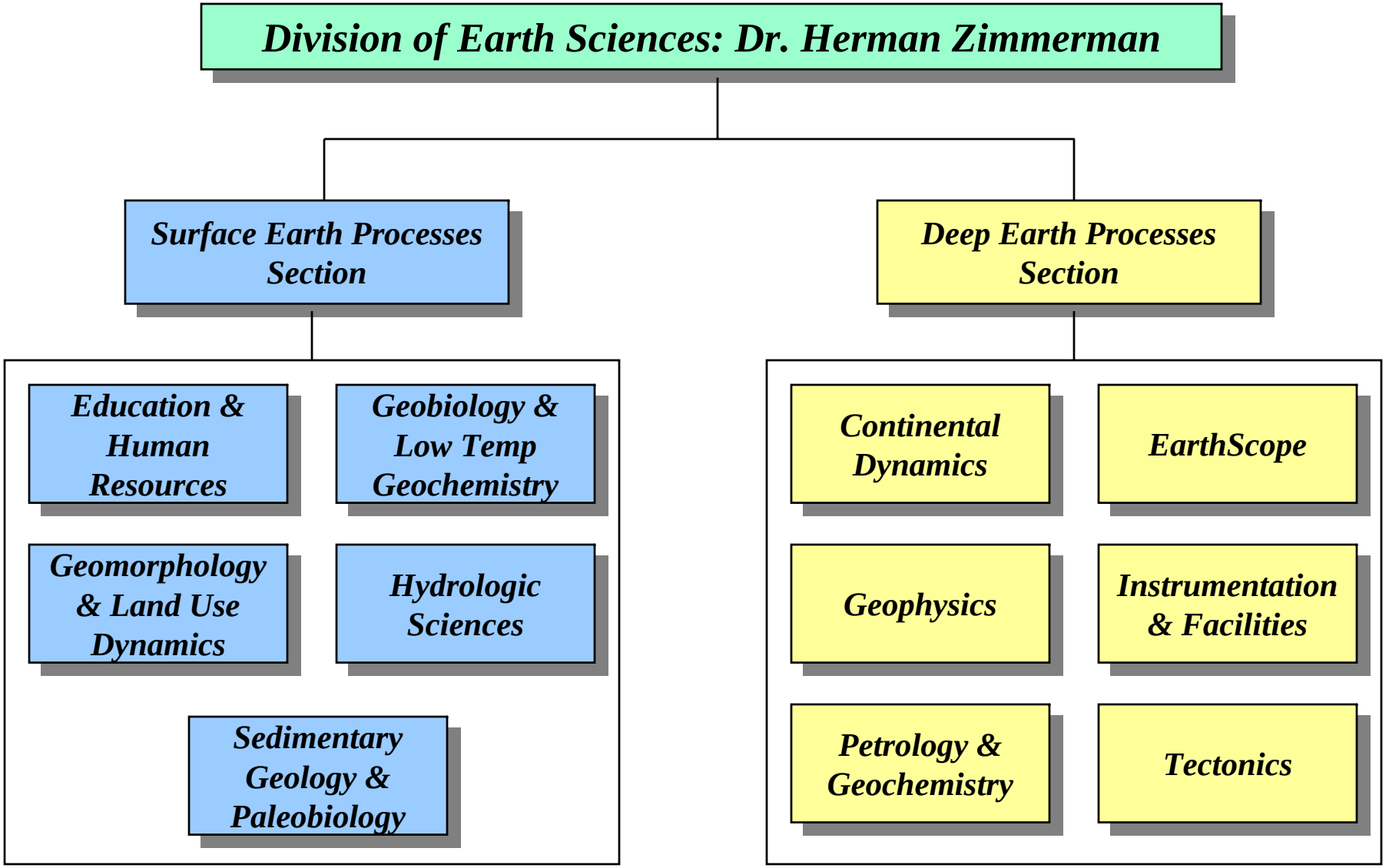

Multi-User Facilities

NSF - University of Arizona Accelerator Mass Spectrometry (AMS) Laboratory

UCLA SIMS Laboratory (**UCLASIMS**)

North East National Ion Microprobe Facility (**NENIMF** @ WHOI)

High-Resolution Computed X-ray Tomography Facility (**UTCT**)

Facility for Electromagnetic Studies of the Continents (**EMSOC** @ UUtah, UWashington, & UC-Riverside)

Institute for Rock Magnetism (**IRM** @ UMinn)

Amino Acid Geochronology Laboratory (**AAGL** @ NAU)

Arizona LaserChron Center (**ALC** @ U. of Arizona)

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Multi-User Facilities

Incorporated Research Institutions for Seismology (**IRIS**)

UNAVCO, Inc. (A Geodetic Consortium)

Drilling, Observation & Sampling of the Earth's Continental Crust (**DOSECC** @ U. of Utah)

Consortium for Materials Properties Research in the Earth Sciences (**COMPRES** @ SUNY, APS, ALS, NSLS)

GeoSoilEnviroCARS Synchrotron Radiation Beamlines at the Advanced Photon Source (**GSECARS** @ Argonne NL)

National Center for Airborne Laser Mapping (**NCALM** @ UFlorida & UC-Berkeley)

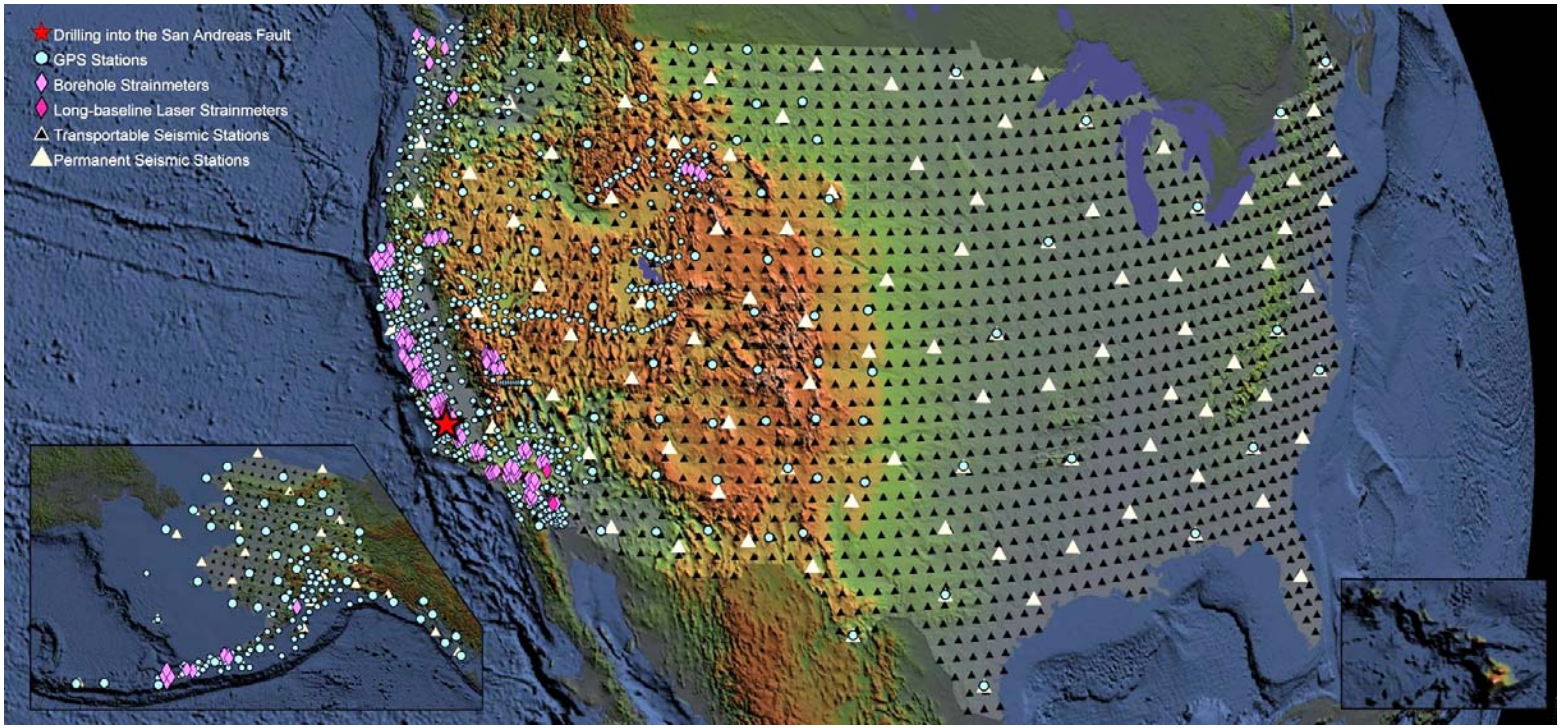
Purdue Rare Isotope Measurement Laboratory (**PRIME Lab** @ Purdue University)

MRE & FC: EarthScope Facility

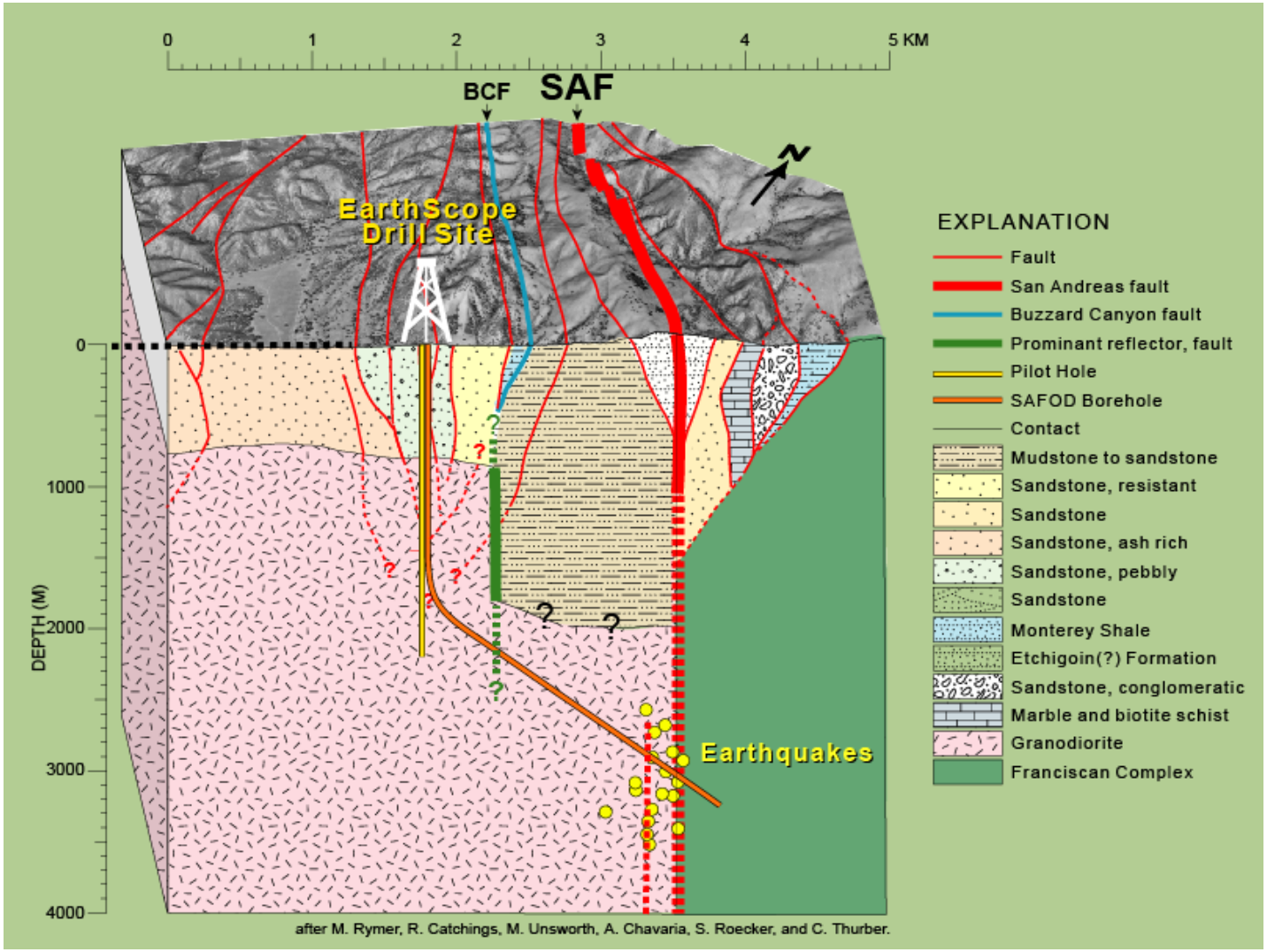
- 875 permanent GPS stations
- 39 permanent seismic stations
- 175 borehole strainmeters
- 5 laser strainmeters

- 400 transportable seismic stations occupying 2000 sites (10 years)
- 40 magneto-telluric systems
- 100 campaign GPS stations
- 2400 campaign seismic stations

MRE&FC Project: $200M construction [science, E&O, cyberinfrastructure]



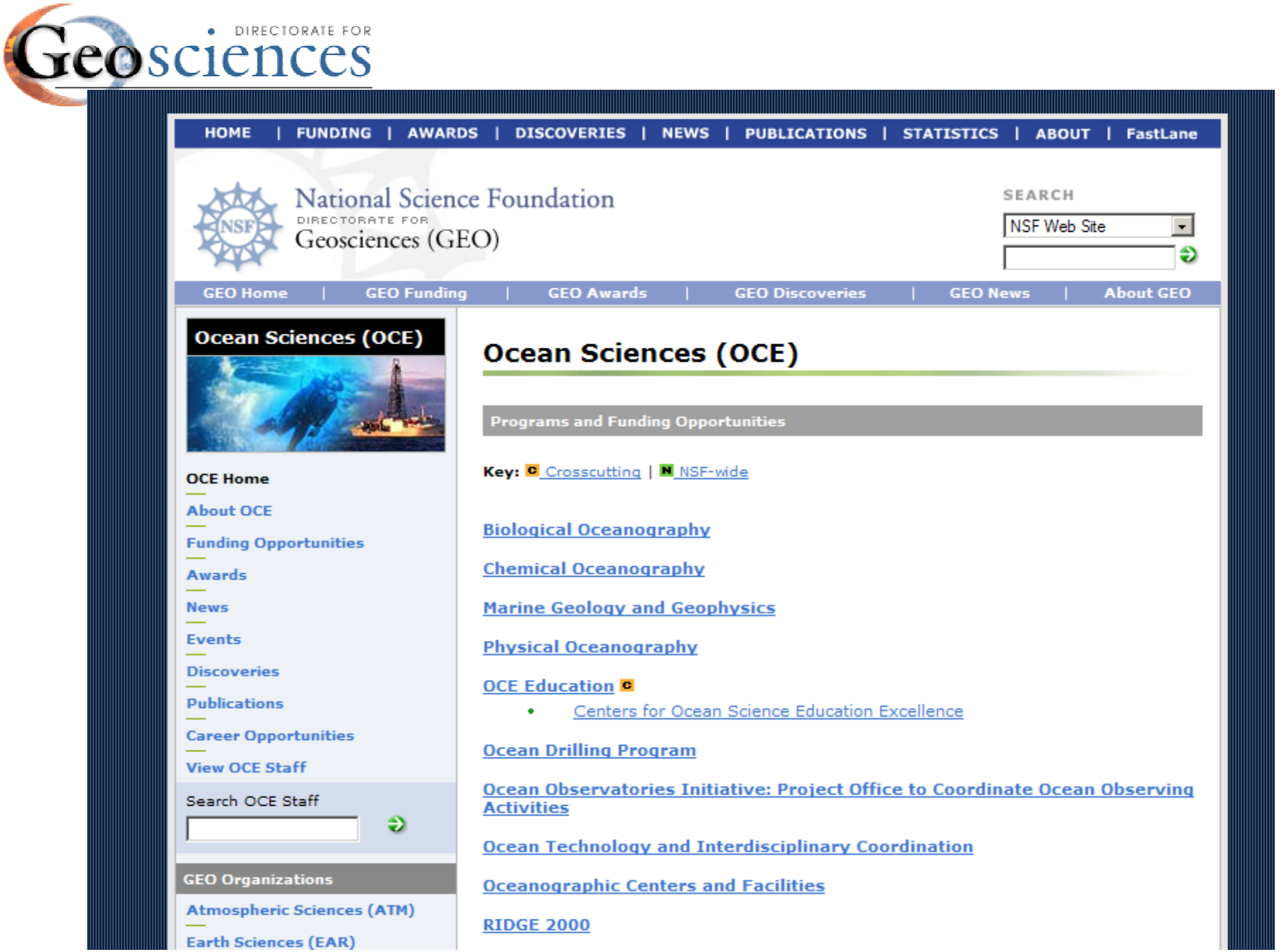
MRE & FC: San Andreas Fault Observatory at Depth



National Center for Earth-surface Dynamics

NSF Science and Technology Center (STC) headquartered at St. Anthony Falls Laboratory (Univ. of Minnesota). NCED's purpose is to catalyze development of an integrated, predictive science of the processes shaping the surface of the Earth, in order to transform management of ecosystems, resources, and land use. NCED participating institutions offer unique field and laboratory locations for research by members of the NCED research community and visitors.

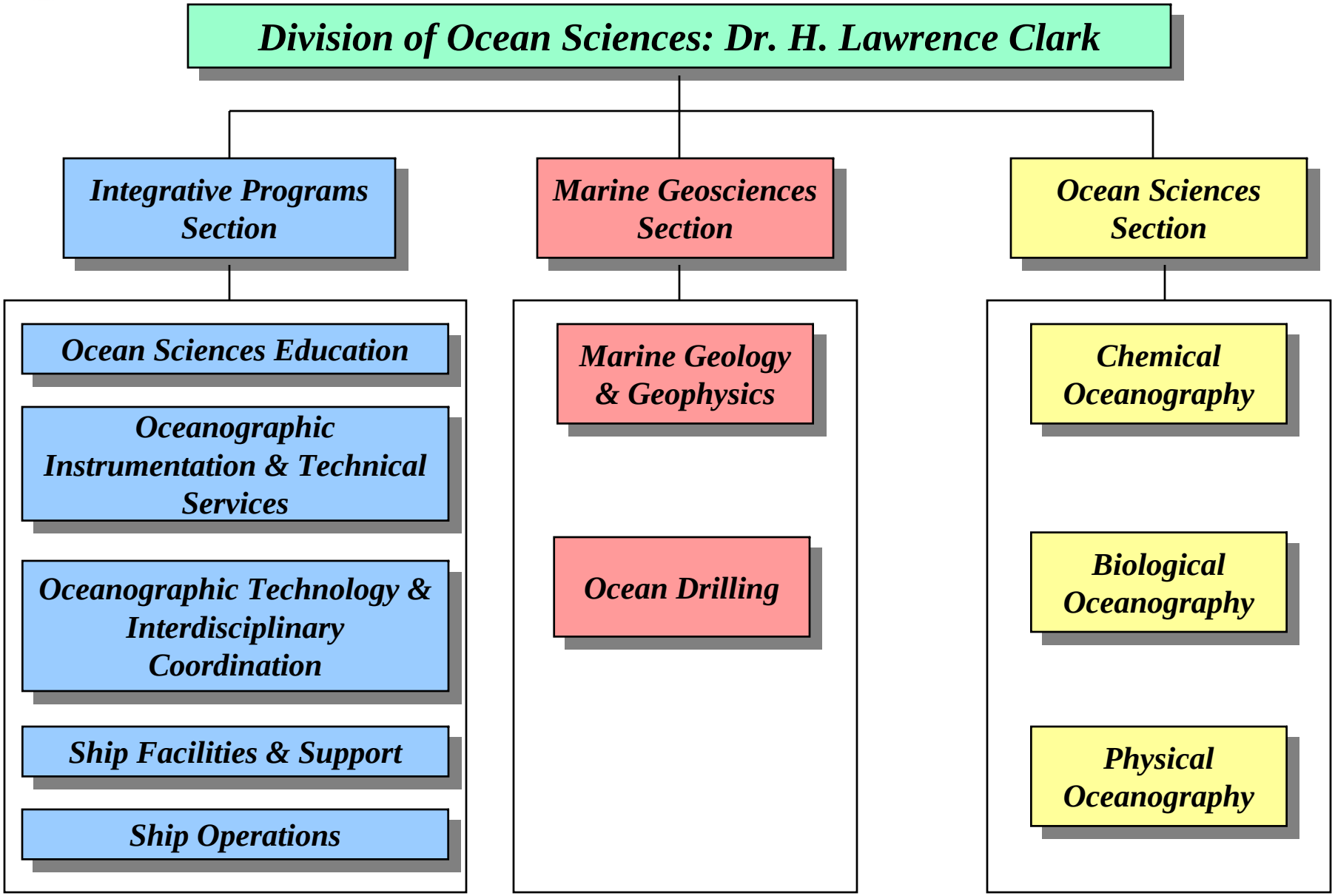
- St. Anthony Falls Laboratory
- Angelo Coast Range Reserve
- Experimental Sedimentology and Geomorphology Lab at MIT
- Ven Te Chow Hydrosystems Laboratory



http://www.nsf.gov/div/index.jsp?div=OCE

Division of Ocean Sciences (OCE)

- supports basic research and education to further understanding of all aspects of the global oceans and their interactions with the solid earth and the atmosphere, including:
  - biological, chemical and physical processes that characterize both coastal seas and deep ocean basins
  - geological and geophysical processes that shape the continental shelves and deep sea floor
  - resource and hazard assessment and the health of the oceans' complex and diverse ecological systems
- supports operation, acquisition, construction, and conversion of major shared-use oceanographic facilities needed to carry out oceanographic-related research programs


Division of Ocean Sciences: Dr. H. Lawrence Clark
Integrative Programs Section
Marine Geosciences Section
Ocean Sciences Section
Ocean Sciences Education
Oceanographic Instrumentation & Technical Services
Oceanographic Technology & Interdisciplinary Coordination
Ship Facilities & Support
Ship Operations
Marine Geology & Geophysics
Ocean Drilling
Chemical Oceanography
Biological Oceanography
Physical Oceanography

Ocean Section – Water Column and Life

- Physical Oceanography
- Biological Oceanography
- Chemical Oceanography

Priority research programs include:

- Non-Equilibrium Ecosystem Dynamics
- Climate variability studies
- Biogeochemical cycling studies
- Interactions between the ocean and the atmosphere, solid earth and ice that surround it.
- transformation of chemical compounds and phases within the marine system
- Marine chemistry, microbial, and ecological studies of stressed environments including coral reefs and harmful agal bloom regions
- Time series.

- Research examples – GLOBEC, CLIVAR, BATS, VERTIGO

Marine Geosciences Section – Seafloor and Ocean Margins

- Marine Geology and Geophysics
- Ocean Drilling Program
- Priority research programs include:
  - Structure, tectonic evolution and volcanic activity of the ocean basins, the continental margins, the mid-ocean ridges, and island arc systems
  - Processes controlling exchange of heat and chemical species between seawater and ocean rocks
  - Genesis, chemistry, and mineralogic evolution of marine sediments
  - Processes controlling deposition, erosion and transport of marine sediments
  - Ocean ridge crest processes and coupling to “vent communities”, macrobiology and sub-sea floor microbial communities.
  - Continental margin studies focused on dynamics and evolution of the ocean-continent transition.
- Research examples – RIDGE 2000, MARGINS

Scientific Ocean Drilling Vessel (SODV)

U.S. Drilling Facility for Integrated Ocean Drilling Program (IODP) (scientific, technical staff of 50)

Joint Oceanographic Institutions is contractor, in alliance with Texas A&M University and Lamont-Doherty Earth Observatory, Columbia University

SODV MREFC managed by Ocean Sciences Division, Geosciences Directorate, with advice and oversight support from a NSF Project Advisory Team and a conversion oversight committee

SODV Highlights	FY05: Select Vessel FY06: Shipyard Conversion FY07: Outfit Laboratories FY07: Begin Scientific Operations
SODV Funding Profile	FY05: $14.88 million FY06: $57.92 million FY07: $42.20 million

SODV Operations funded from NSF R&RA

Recover sediment and crustal rock from beneath the seafloor, to several km depth

Emplace observatories in drillholes

Study deep biosphere, crustal fluids, high-resolution studies of environmental and climate change, solid earth cycles, geodynamics

Student, public education by distance learning, classroom modules, and outreach displays

Learn more at:
http://www.iodp.org/
http://www.joialliance.org/MREFC/

Goals:

- Develop catalytic multi-dimensional partnerships between ocean science researchers and educators
- Foster communication & coordination among ocean science education programs nationwide
- Promote ocean education as a charismatic interdisciplinary tool for improving science education in the 21st century

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