



Rick Anthes

Community Workshop on Air Quality Remote Sensing from Space
National Center for Atmospheric Research

February 21, 2006

<http://qp.nas.edu/decadalsurvey>



ESAS Charge

- **Recommend to NASA, NOAA and USGS a prioritized list of flight missions and supporting activities** to support national needs for research and monitoring of the dynamic Earth system during the decade 2005-2015.
- **Identify important directions that should influence planning for the decade beyond 2015.**

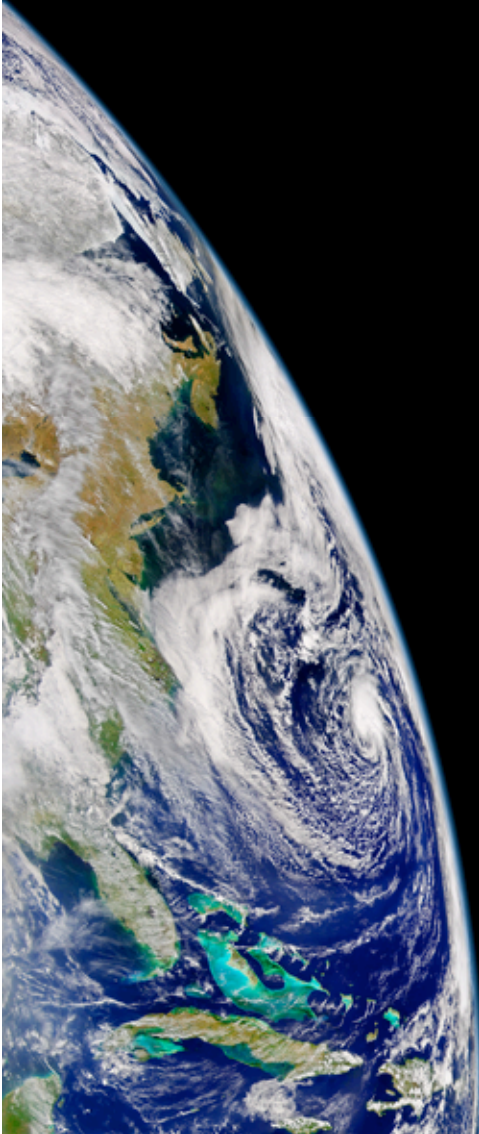


Organization of Study

- Executive Committee (18 members)
- Seven Thematically-Organized Panels
 1. Earth Science Applications and Societal Needs
 2. Land-use Change, Ecosystem Dynamics and Biodiversity
 3. Weather (incl. space weather and chemical weather)
 4. Climate Variability and Change
 5. Water Resources and the Global Hydrologic Cycle
 6. Human Health and Security
 7. Solid-Earth Hazards, Resources and Dynamics

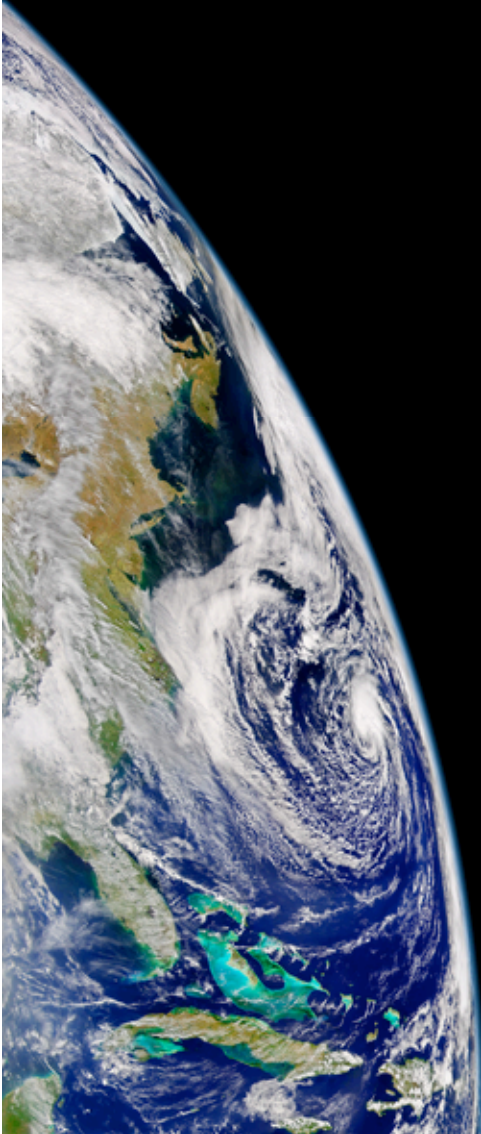
Executive Committee

- Rick Anthes, UCAR, co-chair, atmospheric science
- Berrien Moore, U. New Hampshire, co-chair, biogeochemical cycling
- Jim Anderson, Harvard, atmospheric science, chemistry
- Bruce Marcus, TRW (ret), remote sensing
- Bill Gail, Ball Aerospace, civil space and transition to operations
- Susan Cutter, U. South Carolina, hazards and risk
- Ruth DeFries, U. of Maryland, land use change
- Tony Hollingsworth, ECMWF, weather forecasting
- Tony Janetos, Heinz Center, ecology and land remote sensing
- Kathie Kelly, U. Washington, physical oceanography/satellite obs
- Neal Lane, Rice, policy
- Warren Washington, NCAR, climate
- Mary Lou Zoback, USGS, solid earth
- Otis Brown, U. Miami, physical oceanography
- Susan Avery, CIRES and CU, meteorology, space weather
- Eric Barron, Penn State, climate, paleoclimate
- Dennis Lettenmaier, U. Washington, hydrology
- Mark Wilson, U. Michigan, infectious disease and remote sensing
- Brad Hager, MIT, solid earth



Charge to Panels

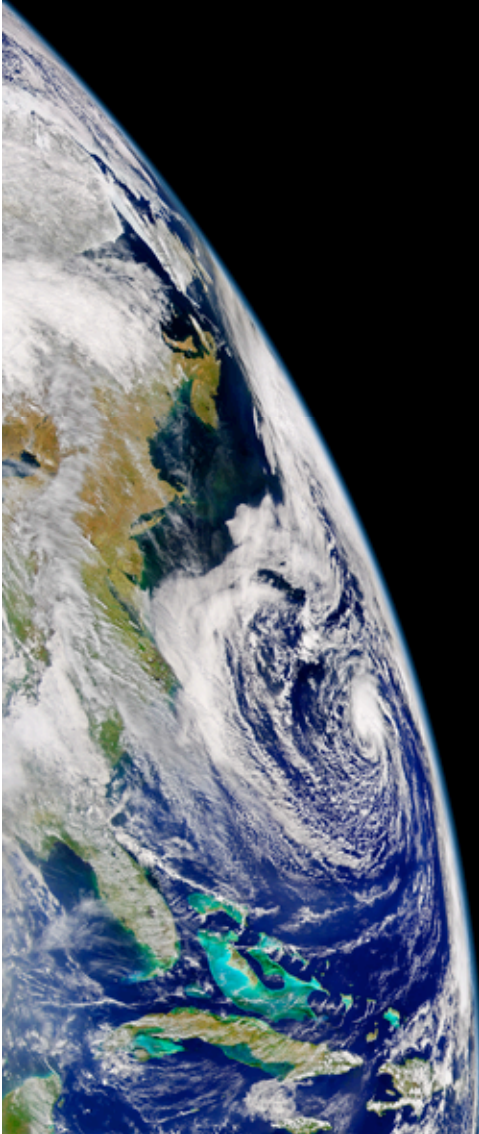
1. Identify needs and opportunities for observations from space to advance Earth science and applications for the next decade and beyond;
2. Propose programs or missions to meet these needs and opportunities, in priority order;
3. Describe each proposed mission in terms of
 - Contributions to science and applications
 - How it meets prioritization criteria
 - Benefits to society
 - Technical aspects
 - Schedule
 - Costs
4. Briefly identify needs for obs that are needed to complement space-based obs
5. Identify essential other components (telemetry, data processing, management and stewardship)



Criteria for Prioritization

Not in priority order

- Contributes to the most important scientific questions facing Earth sciences today (scientific merit-discovery, exploration);
- Contributes to applications and policy making (societal benefits);
- Contributes to long-term observational record of the Earth;
- Complements other observational systems, including national and international plans;
- Affordable (cost considerations, either total costs for mission or costs per year);
- Degree of readiness (technical, resources, people);
- Risk mitigation and strategic redundancy (backup of other critical systems);
- Makes a significant contribution to more than one thematic application or scientific discipline.



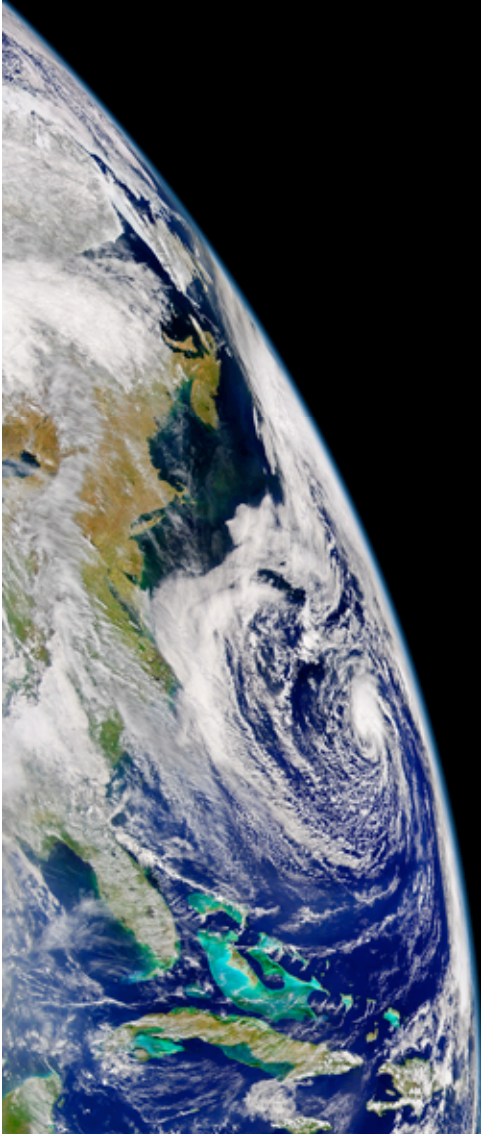


Outline of ESAS Final Report

1. Preface, charge, summary of process, criteria for prioritization
2. Executive Summary
3. Vision
 1. Intellectual challenge-science
 2. Societal benefits
4. Applications and service to society (Societal needs panel)
5. Six panel reports
6. Way forward---Prioritized measurements/missions/correlative needs/needed technology development
7. Summary

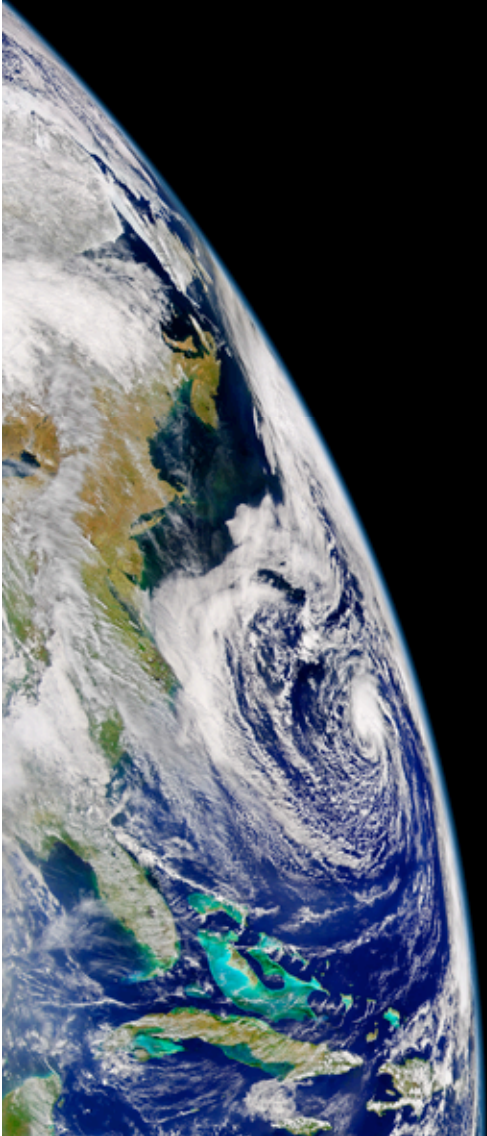
Process so far.....

- August 2004-Community meeting Woods Hole
- Appointment of Panels
- Nov 2004- Meeting of ExCom-Washington,DC
- Dec 2004- Town meeting AGU
- Jan 2005- ExCom meeting Irvine
- Jan 2005-Town meeting AMS
- Jan 2005-RFI released
 - More than 100 responses
(<http://qp.nas.edu/decadalsurvey>)
- April 2005-Interim Report released
- Aug 2005- ExCom mtg Irvine
- Oct 2005- ExCom mtg Washington, DC



Process so far.....

- Dec 31, 2005 Draft Panel input to ExCom
- 12/05-1/06 AGU and AMS Town meetings
- Jan 10-12, 2006 Ex Com Mtg+Panel reps
 - Discussion of panel proposals





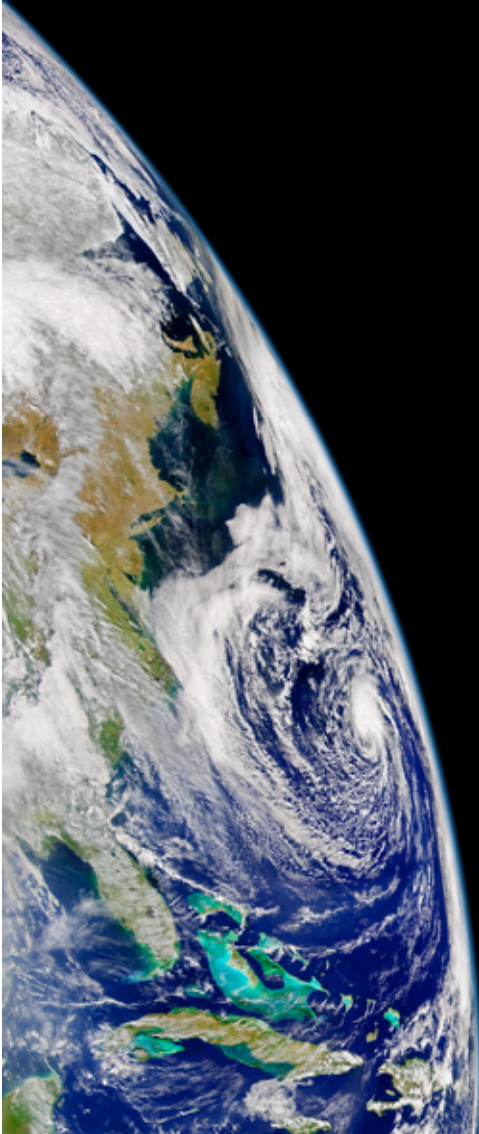
Remaining Schedule

- Feb-Apr 06
 - Panels work on reports, finalize recommendations
 - Costing of proposed mission
 - Final panel reports to ExCom by end of April
- May 1-5, 2006 ExCom meets in Irvine
 - Final ranking of panel proposals
- Aug 22-24 Final ExCom mtg in Woods Hole
 - Edit final report
- Oct 06 Report to reviewers
- Dec 06 Final report

Prioritization Process*

- Jan 06-Panels provide draft “medium-long” list of recommendations to ExCom.
- Reviewers from ExCom assigned to review draft recommendations against prioritization criteria
- January 06-Discussion of draft recommendations by ExCom
- ExCom Feedback to Panels

*After NASA Earth Sciences Senior Review, chaired by Eric Barron (June 16, 2005).





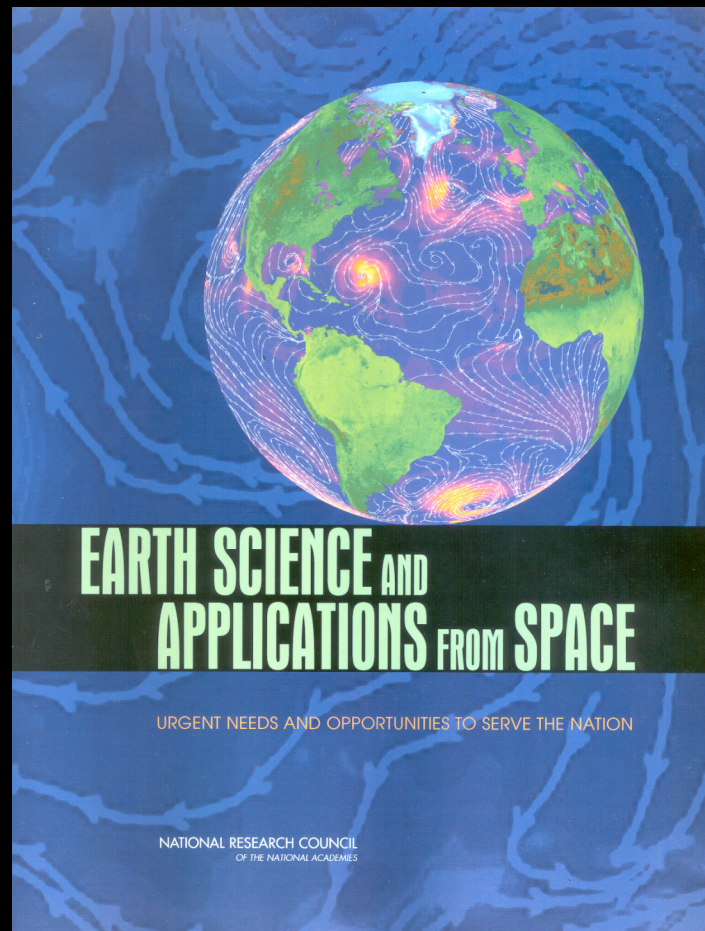
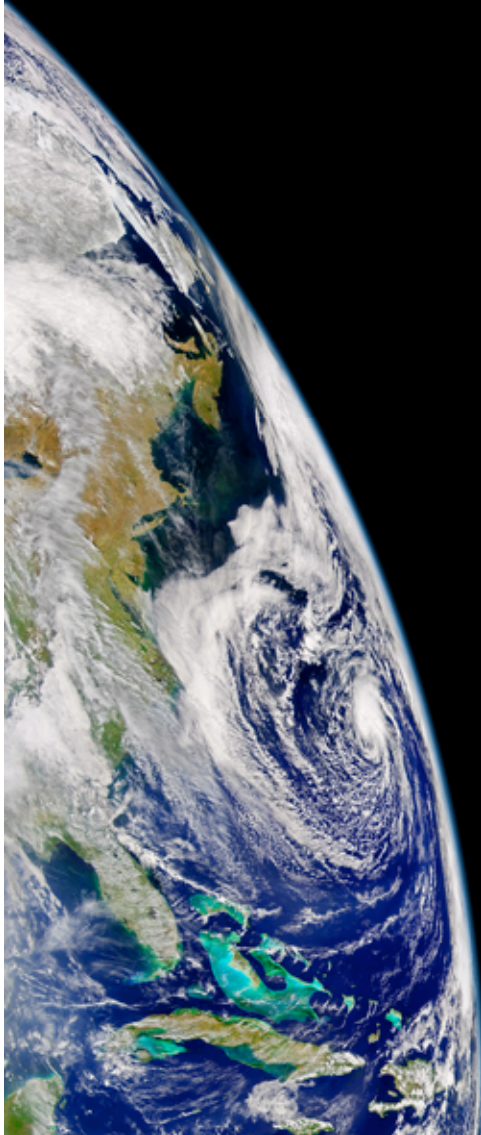
Prioritization Process

- Jan-April 06-Panels meet, refine recommendations, return short list to ExCom
- May 06-ExCom meets and prepares final ranking
- Reality check and review for overall system robustness

Interim Report

Issued Apr 27, 2005

“Today, this system of environmental satellites is at risk of collapse.”





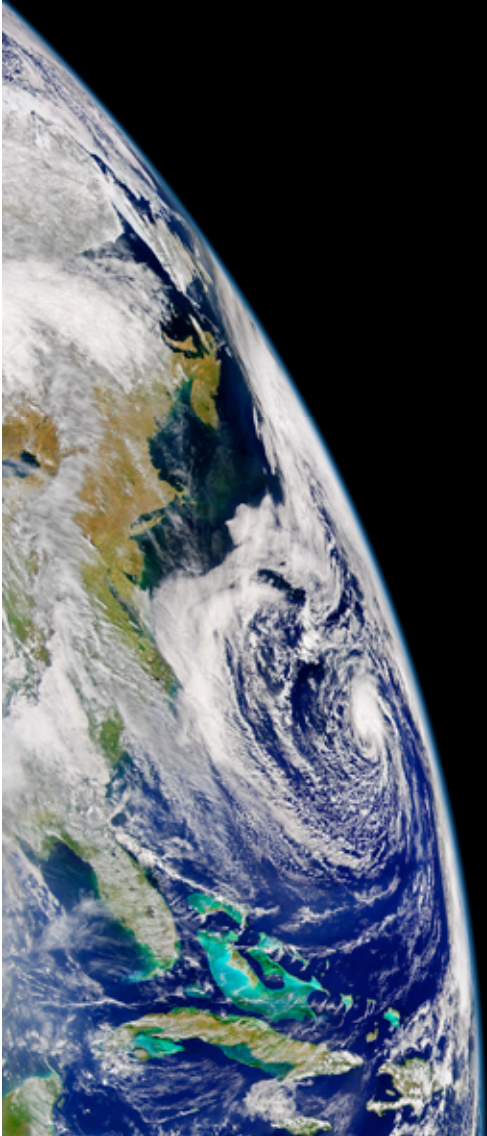
Interim Report

- Overriding Concern: Absence of Plans for Future Research Missions (Mission Queue)
- Consequences of recent canceled, descoped, and delayed missions, including: LDCM, OVWM, GIFTS, Glory (APS and TIM), WSOA, and GPM
- Delays in Explorer (Earth System Science Pathfinder) line
- Steps to ensure climate data records
- Technology base to support new missions, for example:
 - InSAR
 - Wide-swath ocean altimetry
 - Measurement from space of tropospheric winds

Recommendations related to above

Since the Interim Report...

- Major problems with NPOESS
 - Delays of several years
 - Descoping
- NASA terminated two more missions
 - DSCOVR (Deep Space Climate Observatory)
 - HYDROS
 - Earth System Science Pathfinder-ESSP- soil moisture mission
- NASA has slipped GPM launch 2.5 years (December, 2012)
- ESSP Missions: no change in launch schedule for OCO and AQUARIUS (September 2007 and March 2009, respectively)



Since the Interim Report [2]

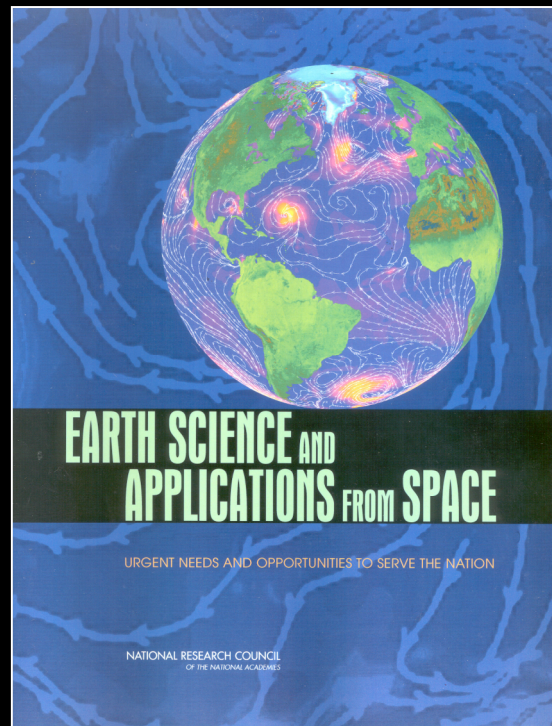
- Next AO for ESSP will not be until fiscal '08, *i.e.*, October 1, 2007 - September 30, 2008
- Identified continuity from research to operations, *i.e.*, NASA/NOAA scientific and budgetary connectivity, as a major challenge to sustaining space-based Earth science observations

We must turn things around!

VISION

A healthy, secure, prosperous and sustainable society for all people on Earth

“Understanding the complex, changing planet on which we live, how it supports life, and how human activities affect its ability to do so in the future is one of the greatest intellectual challenges facing humanity. It is also one of the most important for society as it seeks to achieve prosperity and sustainability.” NRC (2005)





- *Building the Earth Information System (EIS) is central to realize this vision*

- *Intellectual challenge (science)*

- *Applications to serve society*

Over the last decade, ECMWF has pioneered sophisticated mathematical methods which use in-situ & satellite data to improve its forecasts models and its data assimilation system. This has delivered dramatic improvements in forecast skill and a dramatic convergence of forecast skill in both hemispheres.



In partnership with specialists in many disciplines ECMWF has developed a wide range of applications for its 10-day, 1-month and 6-month forecasts as well as for its data assimilation and reanalysis products. Risk assessment and management strategies are in operation or at an advanced stage of development in almost all the GEO areas of socio-economic benefit. The consistent reanalyses from 1958-2004 are an invaluable resource for research and applications in diverse topics relevant to GEO.

**What we do in our generation will determine
the destiny of life on our planet**

**What we do in the next ten
years will determine what is
possible in the next fifty**

