Introductory Remarks for the Evaluation Process

Geesthacht, 1-2 October 1996

Hans von Storch

( Speaker of Forschungsschwerpunkt )
The Objectives of Environmental Research

Thus, environmental research is to some extent a basis research field dealing with fundamental physical-chemical-ecological questions, but at the same time an applied research field answering concrete questions from societal users.
Specifics of Environmental Research

- Openness.
- Large systems.
- Interrelationship in space and time.
- Public relevance.
The Objectives of Environmental Research

- **Understanding of the dynamical processes** controlling the state and its anthropogenic and natural variations.

- **Determination** the system's sensitivity to external factors and its natural range of variation.

- **Analysis** of the current and past state of the system.

- **Prediction** of its near future development.

- **Derivation of scenarios** of possible consequences of anthropogenic modifications.
The Role of Observational Data

Observational data serve a multitude of purposes. They form...

- the basis of the analysis of the present state and possible alarms if anthropogenic effects are passing critical thresholds.

- the statistical evidence for the determination of "geogenic" noise, against which any anthropogenic signals have to be compared.

- the empirical basis for reconstructions of past states.

- the empirical evidence for verifying quasi-realistic models against.
Activity

Observation

- Analysis of present situation
- Comparison of observation with "geogenic noise"
- Determination of "geogenic noise"

Data Bank

- Statistics of variations of state
- Link to other processes
- Dynamical analysis of system

Achievements

specific

- Forecast of immediate future
- Alarm if observ. inconsistent with geogenic noise
- Reconstruction of past variations

general

- Scenarios for future developments
- Political advisory tool
- Scientific knowledge

- Routine management decisions
- Political decisions

Understanding of dynamics of the system

The Role of Monitoring
The Role of Numerical Models

There are two types of models in environmental research:

- **conceptual models** aimed at the understanding of the systems dynamics

- **quasi-realistic models** which approximate reality in detail and may be used for
  - interpolating observed data ("analysis"),
  - extrapolating observed data ("prediction, scenarios")
  - executing experiments on the system's sensitivity to changes in external factors and dynamical components
Environmental Research at GKSS

- **Matrix organisation**: Interaction of institutes through time limited projects.

- "**Double Pull**: Interaction with basic research institutions and clients at governmental agencies and commercial enterprises. Spawning of small companies.
IX Interconnection of research fields

Institutes

Coastal Waters

Inland Waters

Water Cycles

A: Institute of Physical and Chemical Analytics
P: Institute for Atmospheric Physics
G: Institute of Hydrophysics
Water cycle and the flux of matter in the system river-coastal sea - Projects -
GKSS Environmental Research Methods

Satellite

Remote Sensing

LIDAR and RADAR

Clouds and radiation

Water cycle

Analytics

Input

Information system

Sun

Numerical modelling

In situ process studies

Hydro-acoustic

Time series
- basic research
- institutes ("Vorhaben")
- cooperation with universities
- Max Planck institutes etc.

- applied research
- projects
- cooperation with governmental agencies
- commercial companies etc.

The "double pull"
Plan of Presentation

- Introductory remarks by Forschungsschwerpunktsprecher (now)

- Presentation of exemplary work characteristic for the type of research pursued by GKSS. (this morning)

- Presentation of Project Fields by posters. (this afternoon)

- Visit of Institutes. (tomorrow morning)
Achievements

• Technology and know-how for in-situ observations of the hydrographic, and biogeochemical state of rivers estuaries and coastal seas (nutrients, suspended matter, waves, currents, topography of river and sea bed, contaminants, multi-element and species analytics)

• Know-how for the calibration and interpretation of remotely sensed data (examples: MERIS, ScaRaB, newly acquired cloud radar, LIDAR, ERS)

• Development and test of new and cost-effective monitoring strategies of the contaminant and nutrient load of rivers (example: Elbe)

• Capabilities for modelling hydrodynamics and biogeochemical processes in rivers, estuaries and coastal seas (examples: Elbe, Odra estuary, Wadden Sea)

• Capabilities for modelling the elements of the water and energy cycle in a catchment (atmosphere-soil-sea; example: Baltic Sea)

• Techniques for combining observational evidence and quasi-realistic models (example: mercury cycle and contaminants in the Elbe, clouds)

• Implementation of GKSS mesoscale atmospheric circulation model GESIMA as community model at German Climate Computer Center and at other centers.
Future Perspectives - Science

- EUROBASIN

- MAP techniques - Monitoring, Analysis and Prediction.

- Coastal morphodynamics.

- Reconstruction of regional decadal (and centennial) variations.
Salinity [PSU] at LV Borkumriff

- Observation
- Estimation
Future Perspectives - Organisational

• HGF
  - the Helmholtz Research cooperation set up by all Grossforschungsanlagen in Germany.

• Schools
  - dissemination of knowledge about environmental systems in "schools".
  Two NATO schools organized by Raschke, April 1997: "anthropogenic climate change".
HGF Environmental Research

Steering Committee
Speaker: Dr. Popp, FZK

Section 1
Global and Regional Climate Systems
Speaker: Prof. Raschke, GKSS

Atmosphere and Climate
Speaker: Prof. Raschke, GKSS

Geo- and Polar Sciences
Speaker: Prof. Tilzer, AWI

Section 2
River Drainage Areas and Coastal Regions
Speaker: Prof. Fritz, UFZ

Soil
Speaker: Prof. Munch, GSF

Water
Speaker: Prof. Geller, UFZ

Coast
Speaker: Dr. Rosenthal, GKSS

Section 3
Biological Systems
Speaker: Prof. Kettrup, GSF

Section 4
Sustainable Technologies
Speaker: Dipl.-Phys. Arendt, FZK

Technologies
Speaker: Dipl.-Phys. Arendt, FZK

Concepts
Speaker: Prof. Paschen, FZK
Herrmann von Helmholtz-Association of German Research Centers

Section 2: River Drainage Areas and Coastal Regions
The Role of Monitoring