



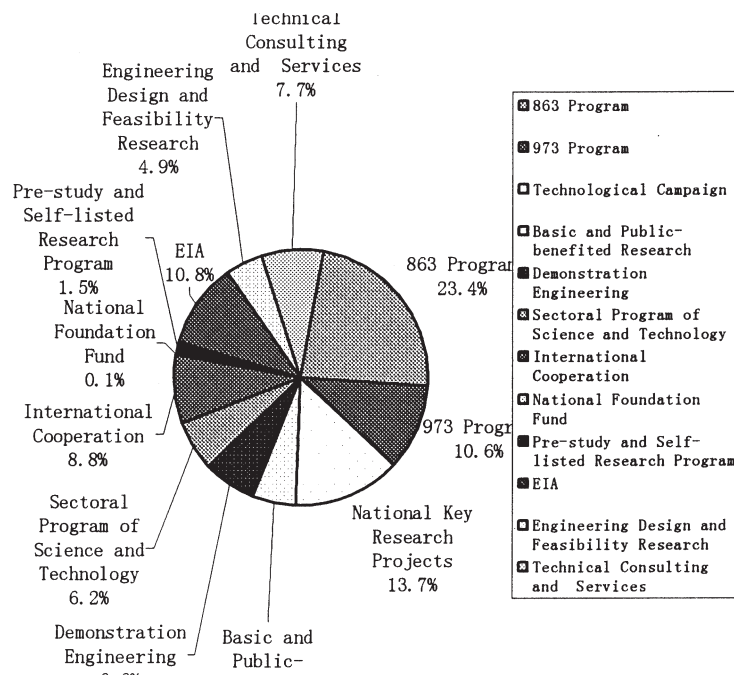
Progress in Ongoing Key Scientific Research Projects

LIU Shusheng

Chinese Research Academy of Environmental Sciences

Oct. 13, 2004

Statistics of funds for ongoing Scientific Research Projects



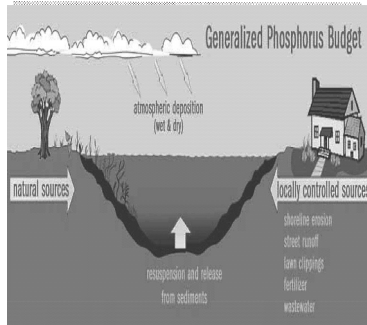
Contents

- Water Environment
- Atmospheric Environment
- Soil and Solid Waste
- Ecosystem
- POPs & EDC
- Environmental Standards
- Environmental Planning
- Basic Environmental Database
- EIP &Circular Economy

1 Research on Water Environment

- ◆ Process of Lake Eutrophication and Mechanism of Water Bloom;
- ◆ Restoration Technology of Ecosystem in Typical Seacoast;
- ◆ Water Quality Monitoring and Assessment of Three Gorges Reservoirs;
- ◆ Mechanism and Control of Low Oxygen Region in Estuary ;
- ◆ Control Countermeasure of Estuary- seashore and Trend Forecast of Ecosystem Aberrance;
- ◆ Dredging Engineering of Serious Polluted Bottom Sludge and Ecology Reconstruction Technology;
- ◆ Ecological Engineering for Cycling use Techniques of Urban Wastewater;
- ◆ Deep Treatment Technologies of Bio-denitrification and Chemical Flocculation Dephosphorization Synchronization.

Research on Breakout Mechanism of Lake Eutrophication and Cyanophyta Water Blooms



The project focus on the driving factors of the lake eutrophication, ecosystem's stable transformation from water bloom to water vegetation, bio-geo-chemistry cycling of nutrient elements and their unbalanced mechanism, N, P translocation and transformation mechanism at the water-sediment interface, Dynamic rules of water bloom and its damage.

Main Research Progress and Findings:

- ◆ Simulation and reappearing of eutrophication's driving mechanism;
- ◆ Occurring process and mechanism of nutrient elements from catchment region in lake;
- ◆ Effects of interface process between water and sediment on the transportation and transformation of nutrient in shallow lakes;
- ◆ Mechanism of water plant degeneration and recovery.



Interaction of Typical Estuary and Seashore and its Environmental Effects

Under the guidance of modern bio-geo-chemistry theory, assessment technology of health ecosystem and its index system would be made out through survey and relative experimental ecological study, which focuses on Chinese typical estuary: Yangtze estuary.



Main Research Progress and Findings

- ◆ Tentative framework of healthy index system for Yangtze estuary ecosystem is set up;
- ◆ Investigation about water quality and benthic organism structure in the Yangtze estuary and its vicinity sea is conducted;
- ◆ Bio-pointers in Yangtze estuary are primarily identified;
- ◆ Common data platform for the study of interaction of estuary-seashore is established

Research on Water Quality Monitoring and Assessment of Three Gorges Reservoirs



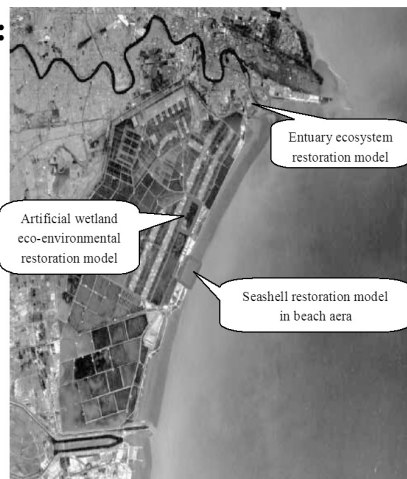
Main Research Progress and Findings:

- Sensitive water area lies in left and right regions of the dam, branch estuary and branch backwater;
- Control factor of eutrophication in Three Gorges Reservoirs is hydrodynamic condition
- Phosphorus probably is the main limit factors for the eutrophication in those rivers and water bodies. The branch Xiangxi river maybe of exceptional.

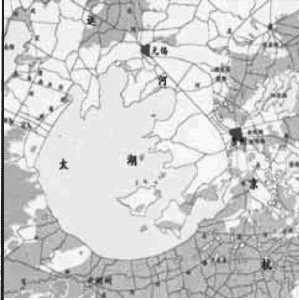
Environmental Restoration Technology of the Typical Coastal Zone in Bohai Sea

Main Research Progress and Findings:

- Great changes of Land use and land cover type in coastal zone;
- Restoration effects of clam and micro bacteria on the pond water and sediment quality;
- Seashell's bearing ability in the polluted environment and its uptake capability of organic matter;
- Demonstrated region for estuary ecosystem restoration is established;
- Tideway structure in Bohai bay;



Dredging Engineering of Seriously Polluted Bottom Sludge and Ecology Reconstruction Technology



Main Research Achievements and Progress:

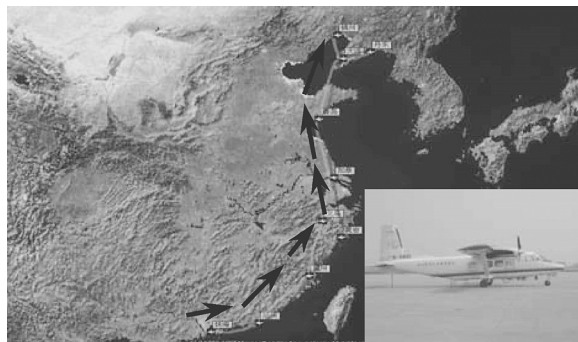
- ◆ The “Auto-control System on the High Precision Orientation and Grubbing Depth for the Twist-inhaling Dredger” is developed;
- ◆ Technology for the Natural Deposition of sediment and stimulated deposition with addition of remedy is made out;
- ◆ A series of studies, including water plant restoration, shell bearing ability in polluted environment and its uptake capability of organic matter are conducted;
- ◆ Research on ecosystem’s stability;
- ◆ Research on technology for water quality improvement;

2. Research on Atmospheric Environment

Projects such as “973”, “863”, National Key Research Projects etc. are carried out in the field of atmospheric environment. Main research fields includes:

Control Technologies and Demonstrated Research on Regional Air Pollutants , Evolvement of Regional Air and Soil-environmental Quality, ABC, Lead Pollution in Atmosphere , Removal Mechanism of Fine Particles Produced by Burning in Atmosphere and Desulphurization Technology.

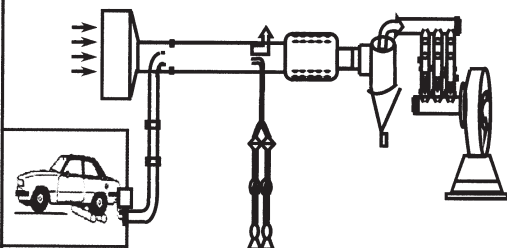
Aerial Survey of Atmospheric Pollutants in Southeast Coast and the Yangtze River Valley



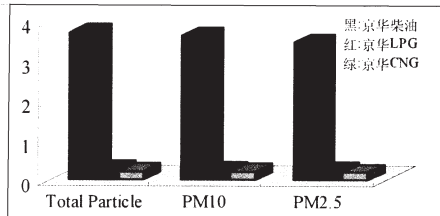
Large-scale investigation and research on gaseous pollutants and aerosols in southeast coast and the Yangtze River valley were carried out through aerial survey and ground monitoring.

- ♦ Serious air pollution is found existing within 3000 meters' high altitude. Meanwhile, trend of complex soot and photochemical pollution is noticed in regional scale.
- ♦ The concentration of air pollutants decreases as altitude increases. If above 1500m, aerosol shows a synthesis character, which indicates combined pollution character after aerosol's transference of long distance, when there is local pollution character under 1500m's altitude.

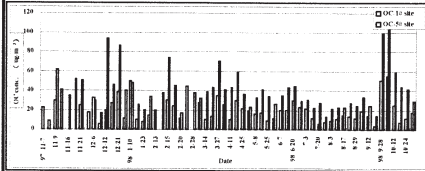
Systematic Research on Collection and Analysis of Particles Emitted from Automobiles



Through emission test of about 30 kinds of vehicles, emission factor and character of different vehicles are gained. It is found that the size of particulates emitted from automobiles is very small, in which the concentration of strong carcinogen BaP[a] exceeds the National Standard greatly.

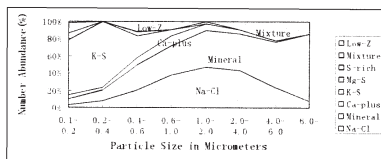


Research on Aerosol Chemistry



1. Research on Aerosols Emission from Biomass Burning

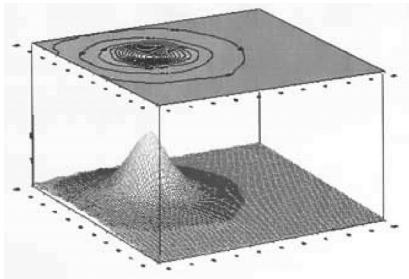
“The Identification of Organic Carbon and Element Carbon in Atmospheric Particulates” obtains second class prize of CAIA.



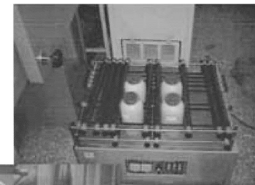
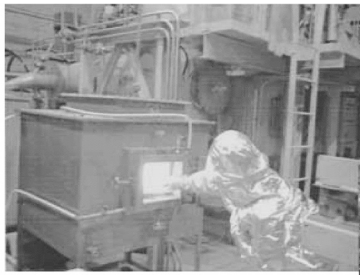
2. SEM Analysis and Characterization of Biomass Burning Particulates

An air reaction process of biomass burning particulates, tracer element K through a chemical species change process from potassium chloride to potassium sulphate to acid potassium sulphate to ammonium sulphate.

3 Research on Solid Waste and Soil Pollution



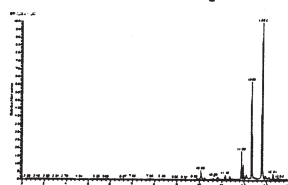
Research and Development of Technology and Instrument on Leakage Detection in Landfill Site



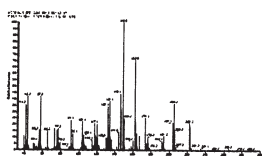
Study on Treatment of Incineration Fly Ash by Melting

Photolysis and Hydrolysis of Herbicides in Water (China National Basic Research Program-973)

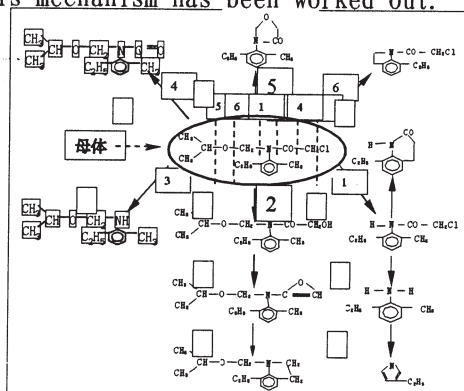
Photodegradation process of Herbicide Propisochlor has been studied and the photolysis mechanism has been worked out.



A. TIC of the photolysed herbicide



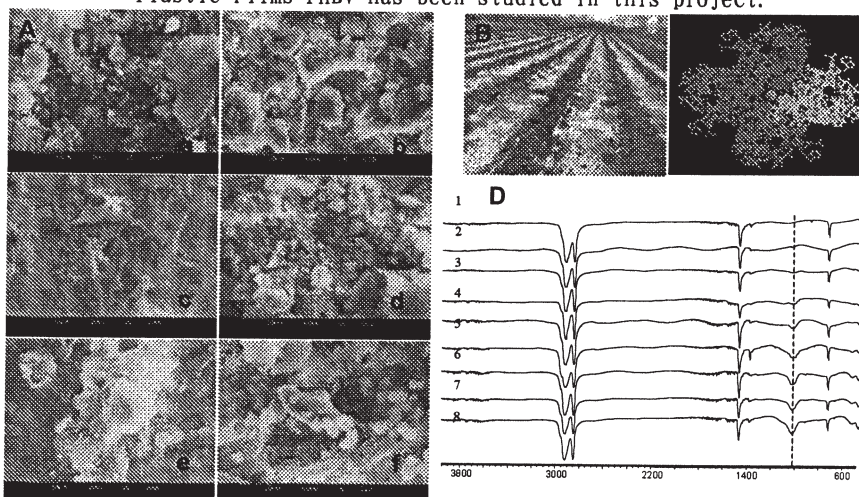
B. GC-MS of the photolysis product



C. Photolysis mechanism of propisochlor

Environmental Behavior of Biodegradable Agricultural Plastic Films (China State S&T Research Programm of MOST)

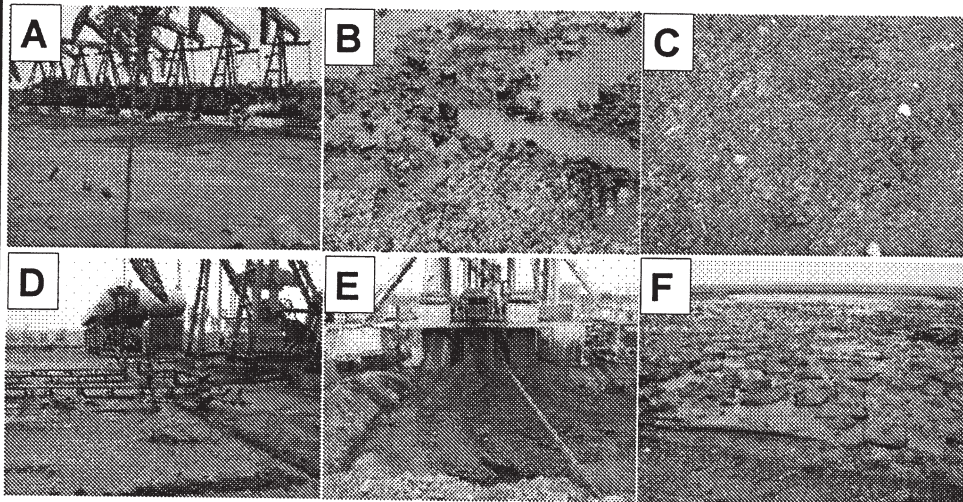
The Degradation Process and Mechanisms of Biodegradable Agricultural Plastic Films PHBV has been studied in this project.



A. Biodegradation of PHBV; a. phaeozem, 20d; b. phaeozem, 40d; c. fluvo-aquic soil, 20d; d. fluvo-aquic soil, 40d; e. krasnozem, 20d; f. krasnozem, 40d (SEM, 2000 \times); B. Agricultural plastic film contamination; C. Degradation mode of plastic films; D. FTIR spectra of the plastic films under different soil conditions

**Environmental Contamination and Restoration of Petrochemical
Polluted Sites (China State S&T Research Programm of MOST)**

Organic pollutants have been collected and analysed to characterize the
contaminated sites in the petrochemical production in this project.



A-F: Petrochemical contamination in oil fields

4 Research on Ecosystem

Survey and Assessment of Present status of Ecosystem in China

- The investigation covers multi-field such as society, economy, environment, resource, ecological disaster and so on ;
- It is the first large-scale and integrated investigation in China since 1949 ;
- The project collects huge amount of scientific data for future research ; (1000GB)
- The project pointed out many neglected ecological problems in China.

Sino-Italian Cooperation Project “Survey and Evaluation on Ecological Environment in Selected Areas of Central China

(1) Remote Sensing Data Process

- The RS data accurate correction(70 scenes) is finished;
- The landuse/landcover is interpreted ;
- Change of landuse in two years is interpreted.

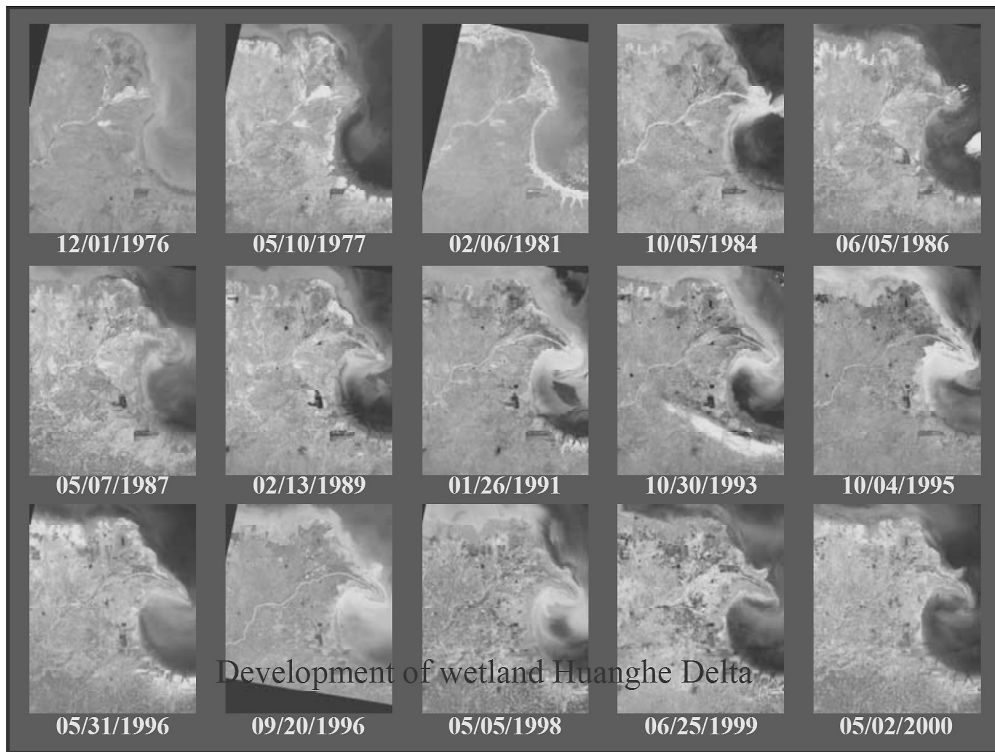
(2) Data and Maps Collection

- Specific maps and data of the research area are collected,including Social Economy, Natural Geography, biology, soil, hydrology, Land Use, and ecological environment

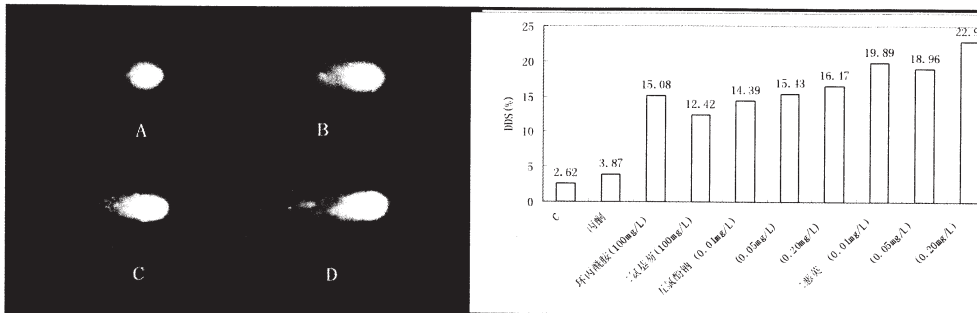
(3) Field Sampling and Analysis

- 1704 soil samples are collected from 213 farmland surface layer in Liaoning, which includes three vertical section(totally 15 plot samples) ;
- 115 soil sample and more than 500 datum have been collected from Yellow River Delta. The analysis involves organism, P, N, soil texture, habitat, vegetation etc.

(4) 25 Ecosystem Investigation Reports



5 Research on POPs



Environmental Toxicology and Risk Study
Risk estimation of Environmental toxic chemicals and Endocrine Disruptors research, such as Dioxins and microcystins etc..

Figure shows the SCGE(Comet) test to dioxin compounds.

6 Research on Environmental Standards

- About 20 Environmental Standards per year
- Emission Standards of Air Pollutants from Power Plant

7 Research on Environmental Planning

- **Zhujiang Delta and Guangdong Province**
- **Ecological Planning of Shenzhen City**
- **More than 10 projects per year**

8 Research on Environmental Background Data

National Environmental Background Database Construction and Service

- The encoding system of national environmental spatial information
- The standard of national environmental spatial information
- National metadata base for environmental spatial information
- Development of sharing platform for environmental scientific database

9 EIP & Circular Economy

EIP & Circular Economy

In late 1990s, China State Environment Protection Administration (SEPA) initiated to promote circular economy and eco-industry, in order to realize the regional sustainable development. Chinese Research Academy of Environmental Sciences (CRAES) assisted SEPA to demonstrate several programs since 1999 in various industries and areas in China.

- **State Demonstration EIP (Sugar), Guigang**
- **State Demonstration EIP, Nanhai**
- **State Demonstration EIP (Aluminum), Baotou**
- **State Demonstration EIP (Paper), Shihezi**
- **State Demonstration EIP (Chemicals), Lubei**
- **Tianjin Economic & Technology Development Area (TEDA) EIP, Tianjin**
- **Suzhou National New & Hi-Tech Industrial Development Zone (SND) EIP, Suzhou**
- **Circular Economy Demonstration City, Guiyang**
- **Circular Economy Demonstration Province, Liaoning**

“Two Metabolism”

- **Waste Metabolism**
- **Product Metabolism**

These new concepts deepen the theory of industrial metabolism and enrich the study contents of the industry ecology.

“Four Combinations”

Considering the characteristics of China, CRAES puts forward the “Four Combinations” principle in designing EIPs.

- **Combining EIP development with exploiting of regional comparative advantage and enhancing of market competition**
- **Combining EIP development with importing of New-and Hi-tech and improving of the economic growth quality**
- **Combining EIP development with regional reconstruction and industry structure adjustment**
- **Combining EIP development with ecological protection and integrated improvement of regional environment**