

Northwest Atlantic



Fisheries Organization

Serial No. N1973

NAFO SCR Doc. 91/89

SCIENTIFIC COUNCIL MEETING - JUNE 1991

Report on the Second World Climate Conference

(Geneva, 29 October-7 November 1990)

by

M. Stein

Institut für Seefischerei, Palmaille 9, D-2000 Hamburg 50
Federal Republic of Germany

The present paper contains a summary on major scientific results presented during the Second World Climate Conference (SWCC) held in Geneva, 29 October-7 November 1990. This summary was presented by the Chairman of the Environmental Subcommittee during the NAFO June 1991 Meeting. The following presentation gives some background information on the agenda of the meeting, the participants and some results. The final remarks represent the personal impression of the author which was shared by participants of the SWCC.

For further information the reader is referred to the IPCC - Working Group reports I-III (IPCC = International Panel on Climate Change) which are available in hard-cover version from Cambridge University Press, England.

The attached figures are transcriptions of coloured transparencies.

SWCC
Second World Climate Conference

- PARTICIPANTS
- PROGRAMME
- RESULTS
- REMARKS

SWCC - Geneva - 29 October - 7 November 1990

SWCC
Second World Climate Conference

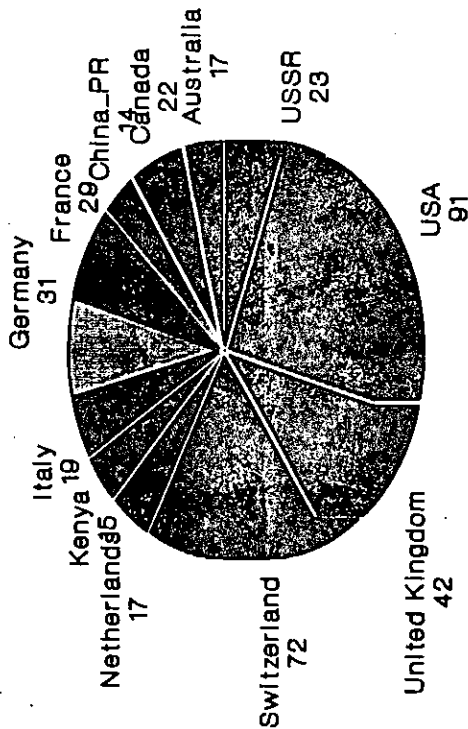


- PARTICIPANTS
- PROGRAMME
- RESULTS
- REMARKS

SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference

* PARTICIPANTS



12 largest Delegations

SWCC Geneva 29 October - 7 November 1990

SWCC Second World Climate Conference

* PARTICIPANTS

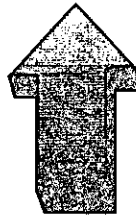
- more than 700 participants from over 100 countries
- NGO's

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

• PARTICIPANTS



• PROGRAMME

• RESULTS

• REMARKS

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

• PROGRAMME

- Introduction, Opening remarks,
Welcome addresses by Sponsor Agencies:
World Meteorological Organization (WMO)
United Nations Environment Programs (UNEP)
United Nations Educational, Scientific and
Cultural Organisation (UNESCO)
International Council of Scientific Unions (ICSU)
Food and Agriculture Organization (FAO)
- IPCC Report
- Overviews of the WCP
- Data and Applications
- Climate Research
- Climate and Climate Impacts
- Task Groups (12 TG's)
- Special Problems in Climate and Climate Change
Panels I, II, III
- IPCC Working Group Activities
- Plenary Panel on the Special Needs of DC's
- Plenary Panel on Co-operation in Intern.Rev.Prog.
- Task Group Reports
- Discussion of Conference Statement
- Closing Ceremonies

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- PROGRAMME

- IPCC Report
Intergovernmental Panel for Climate Change
sponsored by WMO and UNEP

- 3 WG set up in November 1988

- Scientific Assessment of Climate Change

- Assessment of Potential Impacts of Climate Change

- Consider Response Strategies

Results to be presented at SWCC

170 scientists from 25 countries have contributed to IPCC WG I Report, a further 200 scientists have reviewed the draft report

It is therefore an authoritative statement of the views of the international scientific community at this time (Chairman Dr. J.T. Houghton)

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- PARTICIPANTS

- PROGRAMME

- RESULTS

- REMARKS

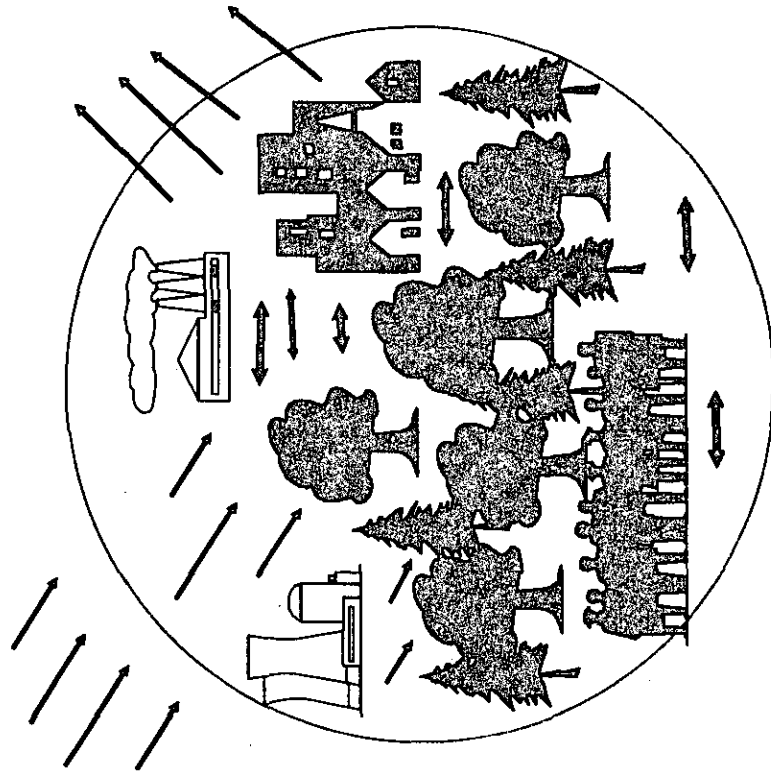


SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

• The Greenhouse Effect



SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- The Greenhouse Effect
solar radiation passes through the clear atmosphere most solar radiation is absorbed by the earth's surface and warms it.
some solar radiation is reflected by the earth and the atmosphere.
infra-red radiation is emitted from the earth's surface
some of the infra-red radiation is absorbed and re-emitted by the greenhouse gases.
The effect of this is to warm the surface and the lower atmosphere
troposphere about 0 - 10 km
stratosphere about - 25 km

SWCC - Geneva - 29 October - 7 November 1990

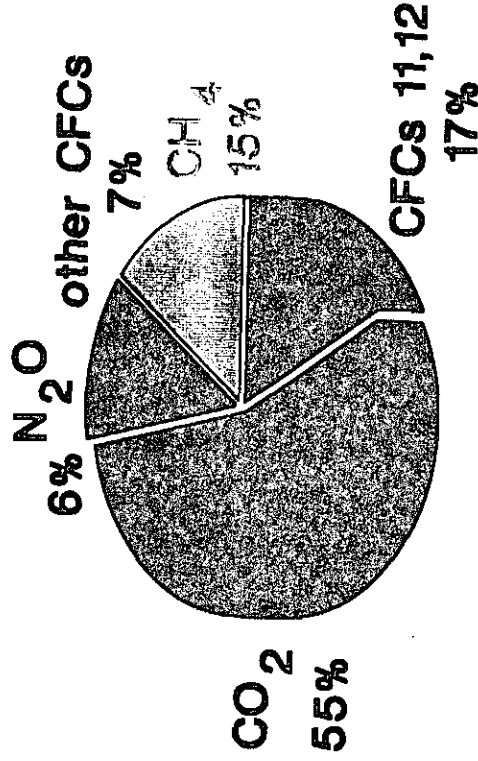
SWCC Second World Climate Conference

	Surface Pressure (Relative to Earth)	Main Greenhouse Gases	Surface temperature in Absence of Greenhouse effect	Warming due to Greenhouse Effect
VENUS	90	> 90% CO ₂	-69C	523C
EARTH	1	-0.04% CO ₂ -1% H ₂ O	-18C	33C
MARS	0.007	> 80% CO ₂	-57C	10C

SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference

Contribution from each of the
Human-made Greenhouse Gases



to the change in
Radiative Forcing from 1980-1990

SWCC - Geneva 29 October-7 November 1990

SWCC

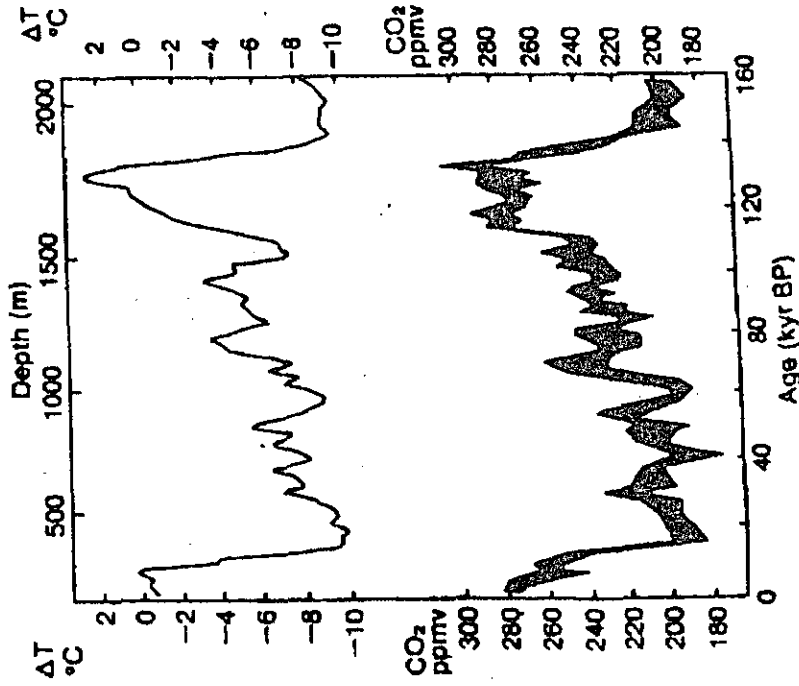
Second World Climate Conference

- Greenhouse Gases Influenced by Human Activities
- CO2 280 353 1.8 (0.5%) (50-200) ppmv
- CH4 0.8 1.72 0.015 (0.9%) 10 ppmv
- CFC-11 0 280 9.5 (4%) 65 pptv
- CFC-12 0 484 17 (4%) 130 pptv
- N2O 288 310 0.8 (0.25%) 150 ppbv
- pre-industrial atmospheric concentration (1750-180)
- current atmospheric concentration (1990)
- current rate of annual atmospheric accumulation
- atmospheric lifetime (years)
- parts per million/billion/trillion by volume

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference



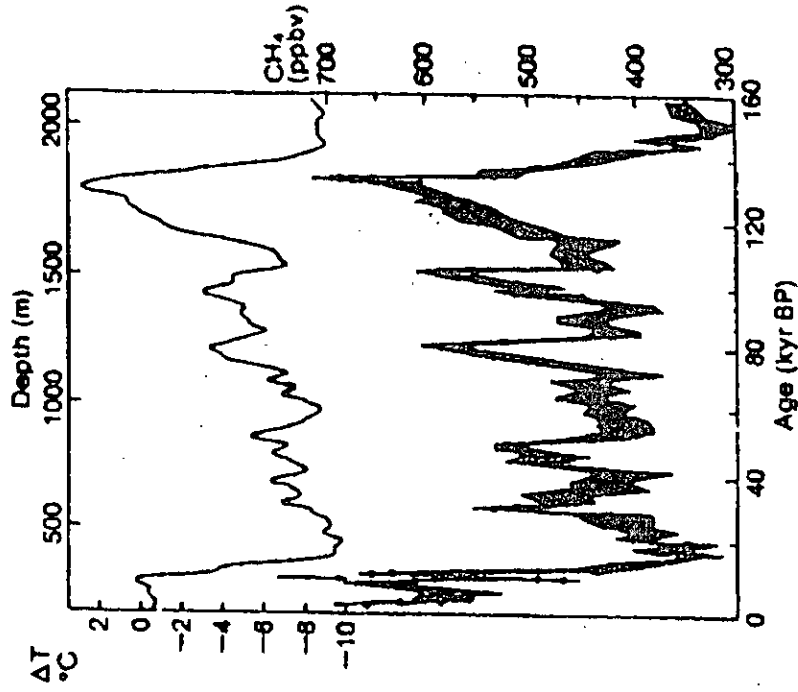
SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference

- Long-Term Atmospheric Carbon Dioxide Variations
- Vostok ice core (Antarctica)
Temperature changes estimated based on the measured deuterium concentrations
160 000 years BP

SWCC - Geneva - 29 October - 7 November 1990

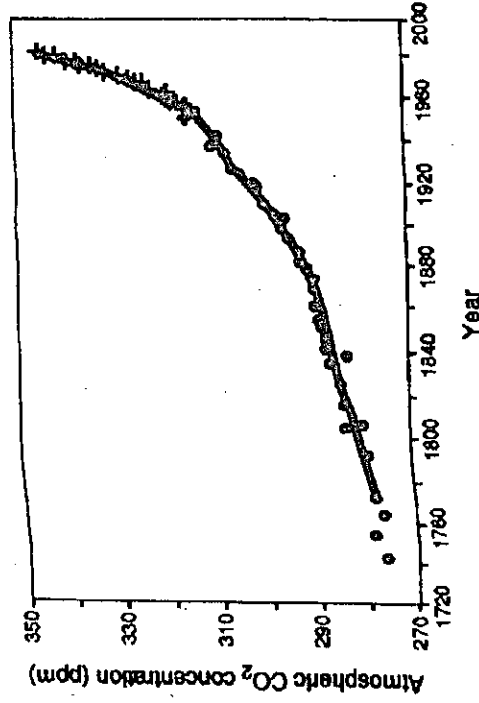
SWCC Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Long-Term Atmospheric Methane Variations
- Vostok Ice core (Antarctica)
Temperature changes estimated based on the measured deuterium concentrations
160 000 years BP

SWCC - Geneva - 29 October - 7 November 1990

SWCC

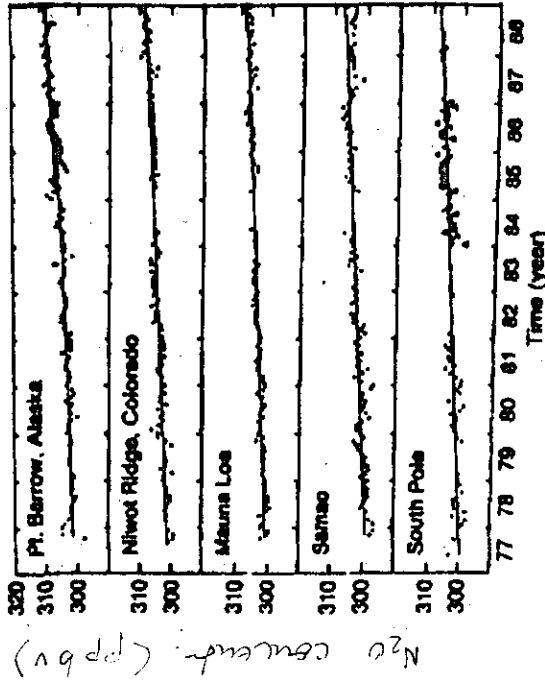
Second World Climate Conference

- Atmospheric measurements of nitrous oxide
- (from the NOAA/GMCC network (Elkins and Rossen, 1989))

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference



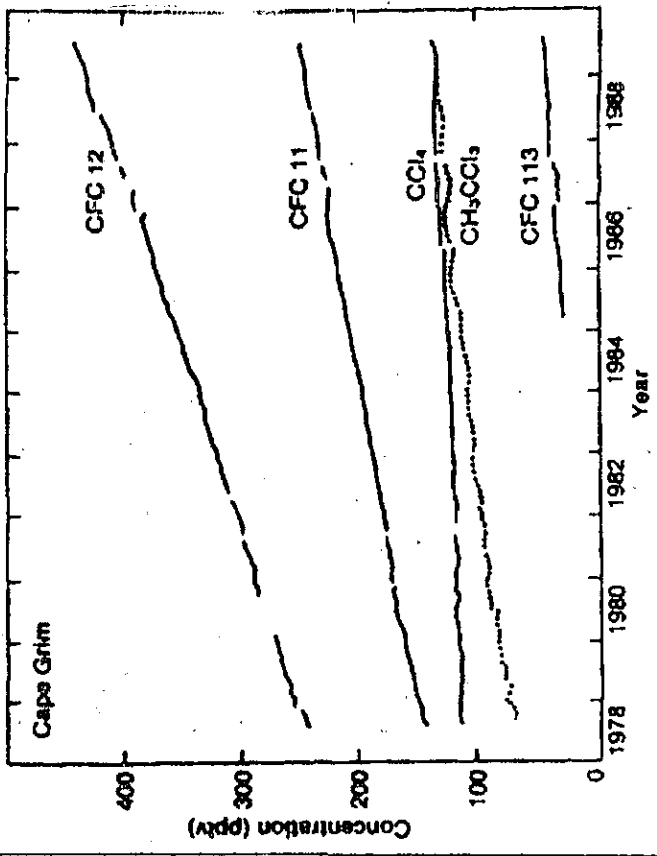
SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference

- Halocarbon concentrations measured at Cape Grim, Tasmania
- (Fraser and Derek, 1989, and unpublished data)

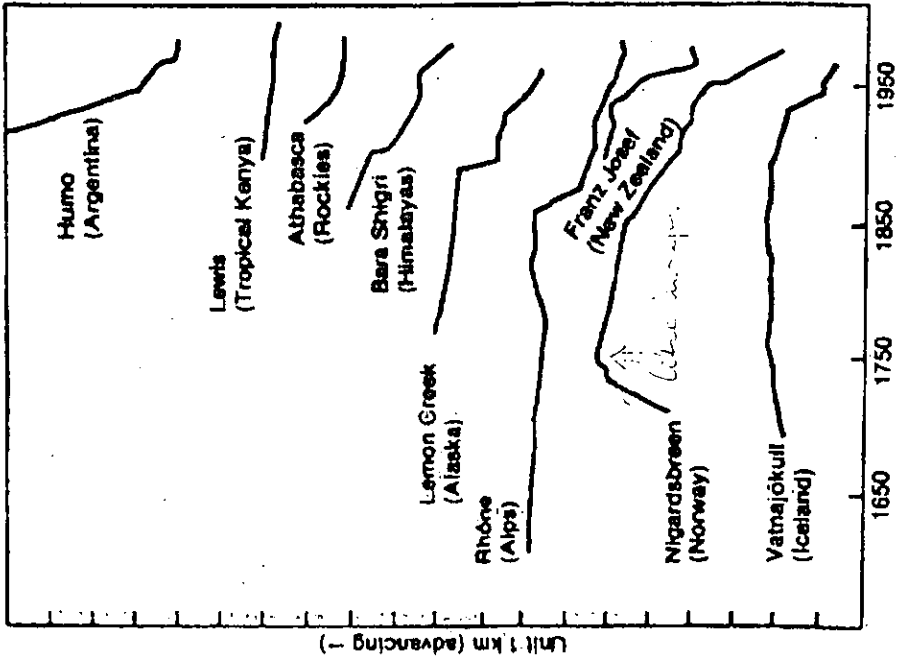
SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference



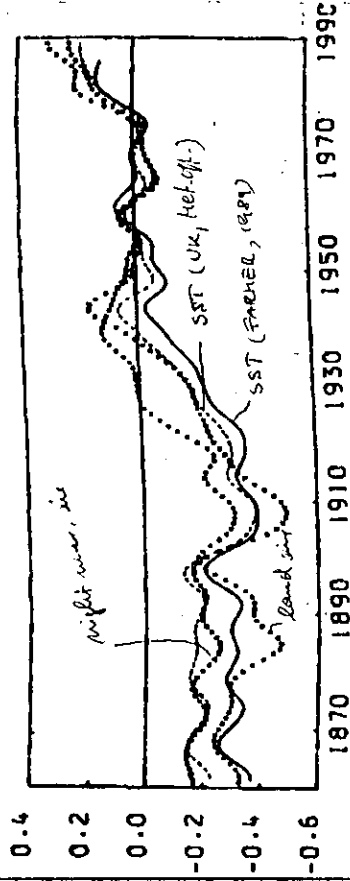
SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

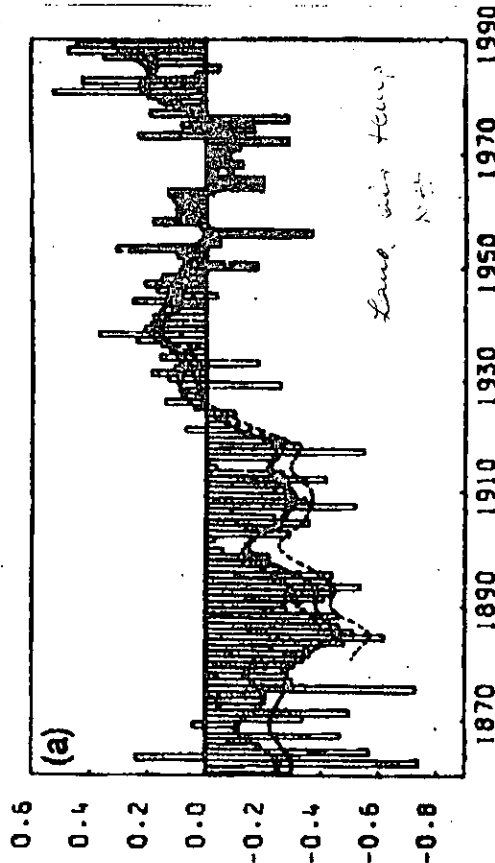
SWCC Second World Climate Conference



Handwritten note: *Handwritten text, possibly 'Handwritten note' or similar.*

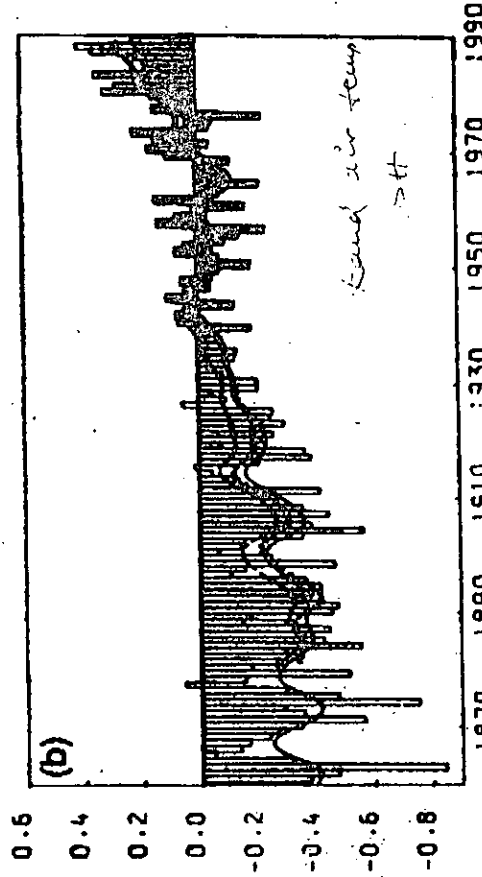
SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

SWCC

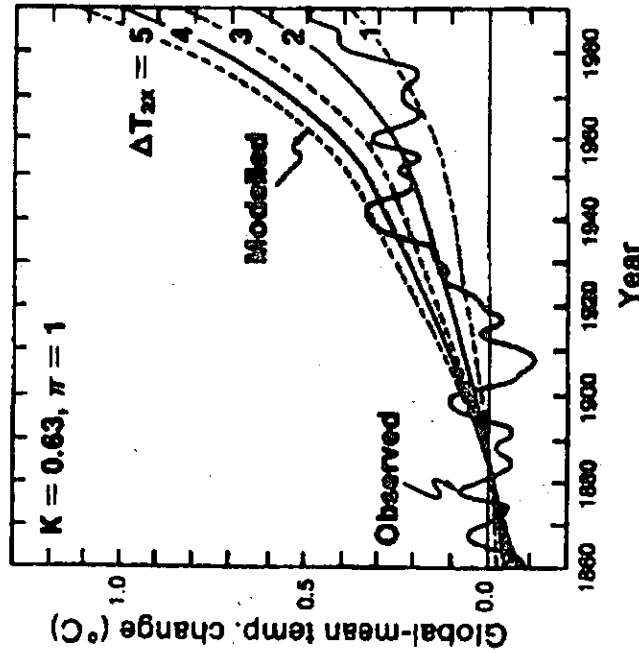
Second World Climate Conference

- Four Scenarios for Climate Models
- Business as usual (BAU) - Scenario A
 - the energy supply is coal intensive
 - only modest efficiency increases
 - Carbon monoxide controls modest
 - deforestation continues until
 - tropical forests are depleted
 - CFCs emissions continue
- Scenario B
 - energy supply mix
 - lower carbon fuels
 - large efficiency increase
 - Carbon monoxide controls
 - deforestation reversed
 - Montreal Protocol implemented
 - with full participation
- Scenario C
 - shift towards renewables and
 - nuclear energy in second half of
 - next century
 - CFCs phased out
 - agricultural emissions limited

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

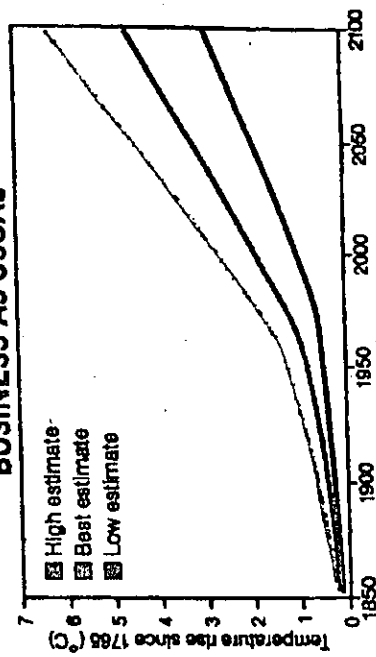


SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

IPCC BUSINESS AS USUAL



SWCC - Geneva - 29 October - 7 November 1990

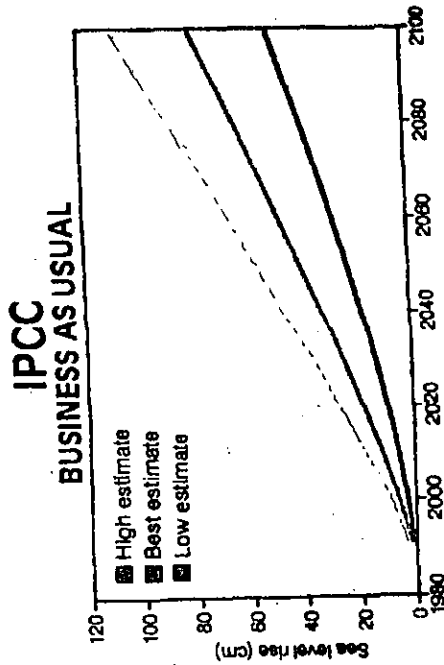
SWCC

Second World Climate Conference

- Four Scenarios for Climate Models
- Scenario D
 - shift to renewables and nuclear energy in first half of the next century
 - stringent controls in industrialized countries
 - moderated growth of emissions in developing countries
 - Carbon dioxide emissions reduced to 50% of 1985 levels by middle of next century

SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

SWCC Second World Climate Conference

- o Oceanic Feedback Effects
- o Ocean Temperature
CO2 chemistry changed
 ▣▣> decrease of net uptake
 ▣▣> amplify effect of about 5%
- o Ocean Circulation
thermocline more resistant
modified wind stress ▣▣>
circulation change
(e.g. Greenland ice cores)
- o Possibility of unexpected events
can not be excluded

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Oceanic Feedback Effects
- Ocean temperature changes can effect sea water CO2 chemistry surface-water pCO2 will increase with increasing temperature => decrease in net uptake by the oceans
- future atmospheric CO2 increase may be amplified by about 5% due to this effect
- Ocean circulation thermocline more resistant to vertical mixing and slow down the uptake of anthropogenic CO2
- modified wind stress may effect circulation
- Greenland ice cores indicate during last glaciation significant CO2 concentration shifts may have occurred within less than 100 years, probably caused by strong changes of large-scale ocean circulation
- possibility of unexpected abrupt events may take place in the natural carbon system can not be excluded

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Gas Exchange Rates change global wind pattern => change gas transfer probably minor influence
- Modification Oceanic Biogeochem. Cycle flux balance carbon/nutrients disturbed => atmospheric CO2 increase amplified
- UV-B Radiation reduction stratospheric O3 => increase UV-B radiation
 - => decrease of marine productivity
 - => negative effect on biol. pump
 - => increase CO2 in surface water
 - => increase atmospheric CO2

SWCC - Geneva - 29 October - 7 November 1990

25

SWCC

Second World Climate Conference

- UV-B Radiation reduction in stratospheric O3 would increase intensity of UV-B radiation at the earth surface. Might have negative effects on marine biota due to a decrease of marine productivity and thus on the biological carbon pump. This could lead to an increase in the concentration of CO2 in surface waters and consequently in the atmosphere

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Gas Exchange Rates change in global wind pattern could influence gas transfer atmosphere/ocean surface carbon cycle models show however that net CO2 uptake by global ocean not sensitive to gas transfer coefficients (controlled mainly by vertical mixing, not by gas exchange) this effect probably of minor influence
- Modification of Oceanic Biogeochemical Cycling export flux of carbon (and nutrients) out of the ocean surface which is under normal conditions balanced by equal upward transport of dissolved carbon (and dissolved nutrients) by water motion in polar regions and strong upwelling zones, where productivity is not limited by nitrogen or phosphorus balance could become disturbed, so as to influence atmospheric CO2 as result of climate change distribution of marine ecosystems and species composition could change => effect pCO2 in surface waters; not possible to predict direction and magnitude of such effects Warming of the oceans might lead to accelerated decomposition of dissolved organic carbon, converting it into CO2, amplify atmospheric increase

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Stratospheric Ozone
- reduction of stratospheric ozone can modify the surface temperature via two compensating processes: more solar radiation is transmitted to the surface-troposphere system, thereby contributing to a surface warming; on the other hand the cooler stratosphere (due to decreased solar and long-wave absorption) emits less to the troposphere which would tend to cool the surface.
- magnitude as well as sign of change in surface temperature depends critically on the magnitude of the ozone change; which in turn depends strongly on altitude, latitude and season

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Impacts on Fisheries
 - changes in ocean circulation
 - loss/establishment of certain populations
- Approach to Identify Impacts
 - historical analogs
 - biological consequences
- Warming Impact Pos./Neg.
 - Atlanto-Scandinavian herring/ North Sea herring
- Permanent Change more profound

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Impacts on Fisheries
Climate change one of the most important factors affecting fisheries. Each population within a species adapted to hydrodynamic structure of specific temporal and spatial features. Changes in ocean circulation => loss of certain populations or establishment of new ones at the periphery of the species area of distribution
- Approach to Identify Impacts
historical analogs => biological consequences during decadal scale of warming during first half of present century (e.g. penetration of tropical and subtropical marine organisms into the temperate latitudes and the penetration of boreal organisms into the higher latitudes => North Pacific and North Atlantic)
- Warming impacts either positive or negative even for same species, depending on region (e.g. in 1940s and 1950s, increased water temperature coincided with largest year of biomass of Atlanto-Scandinavian herring, while North Sea herring biomass fell to very low levels)
- Fluctuations within a few years shown by those examples. Impacts of a far more permanent change in temperature even more profound. Commercially important fish stocks may take new spawning areas and their distribution patterns may change considerably

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Mariculture affected
warming of near-shore waters
=> increased production
neg. results in areas near to optimum conditions
- Impact of UV-B Radiation
fish eggs and larvae
near-surface phyto/zooplankton, corals
genetic abnormalities/mortality
(e.g. anchovy, shrimp and crab larvae)

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Mariculture affected by Climatic Change increasing near-shore temperature => increased production (temperatures near to those optimum for growth in higher latitude farming)
Cultivation of new species of temperate and subtropical origin
decrease in ice cover => expand geographical limits for commercial operations (e.g. salmonids, oysters and scallops)
Negative results in areas which are near to optimum conditions

- **Impact of UV-B Radiation**
although most sea water may be relatively opaque to UV-B radiation, fish eggs and larvae that float close to the surface, as well as near-surface phytoplankton zooplankton and corals could be exposed to levels which will cause genetic abnormalities or direct mortality.
Recent investigations show that UV-B radiation exposure could have lethal effect on several marine species (e.g. anchovy, shrimp and crab larvae)
[UV-A: 320-400nm(28); UV-B: 280-320nm(77); UV-C: -280nm(100) in bracket percent. of absorption]

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- **TASK GROUPS (12)**
Objectives to work out conclusions and give recomm. which go to the SWCC final statements
 - Water
 - Agriculture and Food
 - Oceans, Fisheries, Coastal Zone
 - Energy
 - Land Use and Urban Planning
 - Human Dimensions
 - Environment and Development
 - Forests
 - WCP Overview - WCRP
 - WCP Overview and Future
 - Scientific components of international agreements
 - Synthesis (1 - 11)

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Summary Statement
 - scientific consensus on estimate of rate of global warming to be expected during 21 st century
 - if increase of greenhouse gases concentrations not limited predicted climate change would place unprecedented stresses on natural and social systems
 - nations should now take steps towards reducing sources and increasing sinks of greenhouse gases (global convention on climate change)

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Summary Statement
 - without actions to reduce emissions (BaU-scenario) global warming will be
 - 2 - 5 C over next century, a rate of change unprecedented in the past 10 000 years
 - sea level rise of 65cm +- 35cm by the end of next century
 - global warming delayed by the oceans; much of the change is still to come; inertia in the climate system due to the influence of the oceans, the biosphere and the long residence time of some Greenhouse Gases means that climate changes that occur will persist for centuries

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- Summary Statement
 - historical growth in emissions consequence of the increase of human population, rising incomes, the related exploitation of fossil fuels by industrialized societies and expansion of agriculture
 - prudent to exercise the "precautionary principle"
 - to stabilize atmospheric carbon dioxide concentrations by the middle of the 21st century at less than double pre-industrial concentrations, a world-wide reduction of net carbon dioxide emissions by 1 to 2% per year would be required

SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

- PARTICIPANTS
- PROGRAMME
- RESULTS
- REMARKS



SWCC - Geneva - 29 October - 7 November 1990

SWCC

Second World Climate Conference

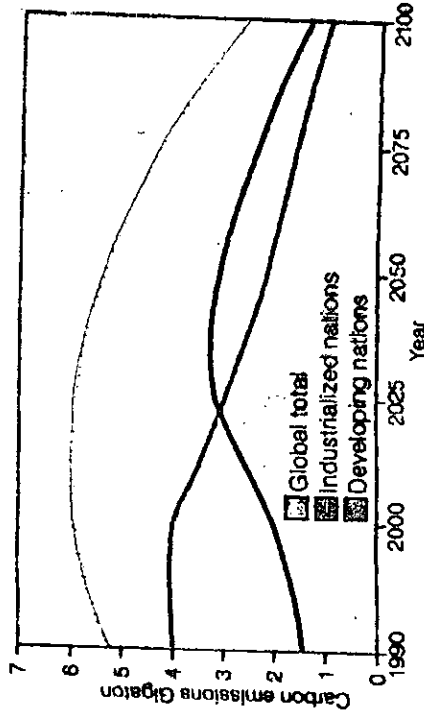
REMARKS

- there was a common feeling at the SWCC final Session on Friday evening 3 November 1990 to reach a bearable consensus
- however, preparatory papers for the ministerial sessions on 6 and 7 November 1990 watered the scientific statement to the extent that the BaU-scenario might be taken by politicians
- statements by NGOs on feedback mechanisms in the climate system which refer to the IPCC WG I Report indicate dramatic amplifying feedbacks
- the climate scenario would then be even worse than predicted by the BaU-scenario

SWCC - Geneva - 29 October - 7 November 1990

SWCC

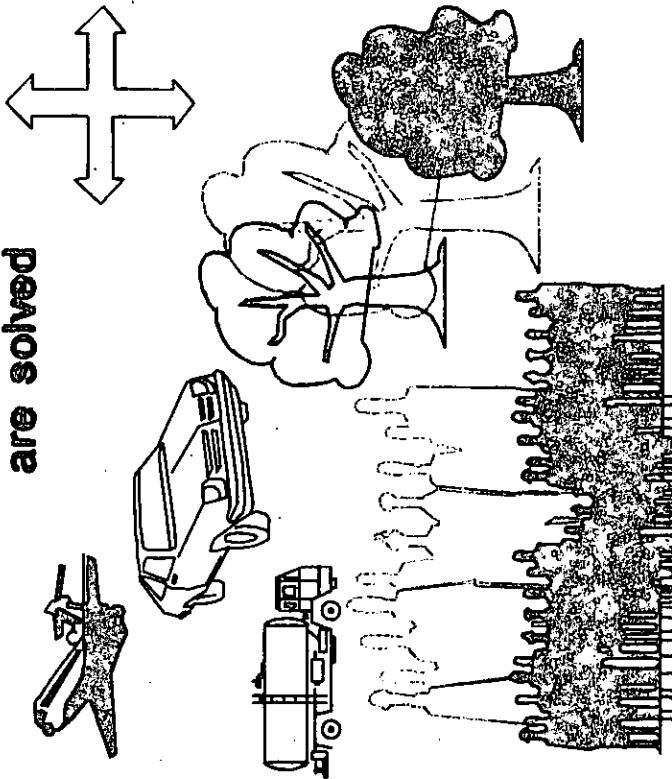
Second World Climate Conference



SWCC - Geneva - 29 October - 7 November 1990

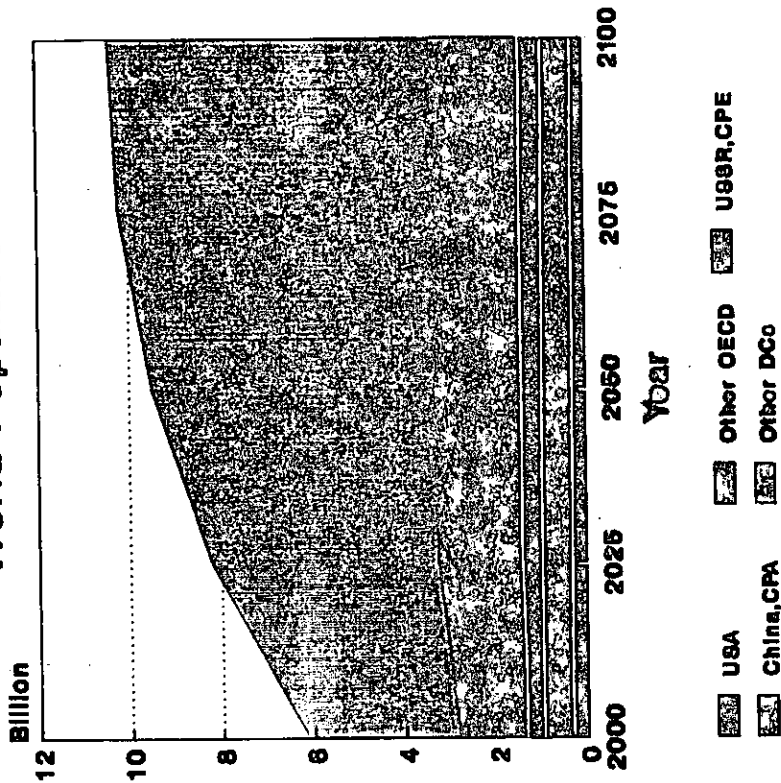
SWCC
Second World Climate Conference
Survival of Humankind

at Stake
unless urgent problems
are solved



SWCC - Geneva - 29 October - 7 November 1990

SWCC
Second World Climate Conference
World Population



SWCC - Geneva 29 October-7 November 1990