Next Generation Climate Projection for Mekong Region

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Current Modeling Status

FEATURES

- Atmosphere-Ocean Coupled General Circulation Model (AOGCM)
- GCM forced by emission-based atmospheric GHG from IPCC (2000) Special Report on Emission Scenarios (SRES)
- Downscaled to region or points using dynamic or statistic approaches, such as SDSM and PRECIS

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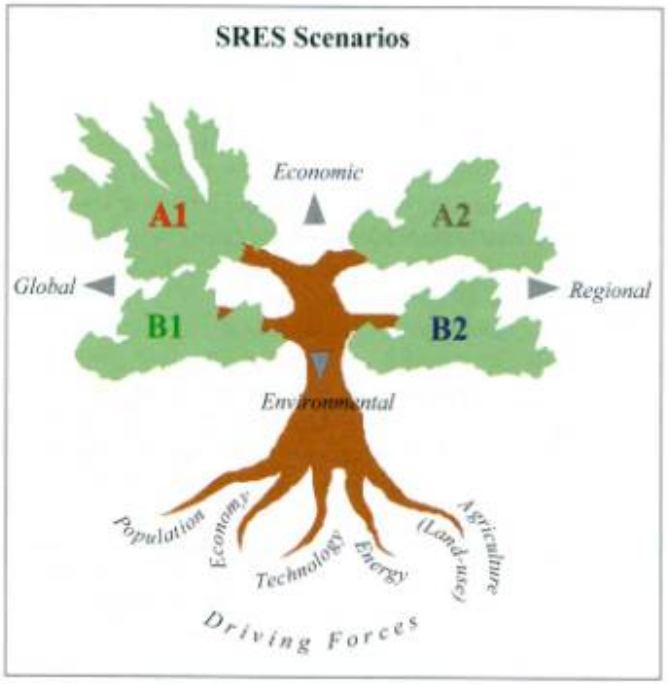

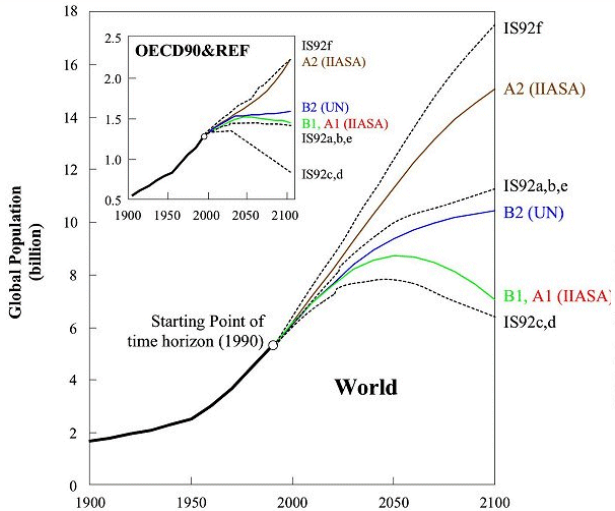

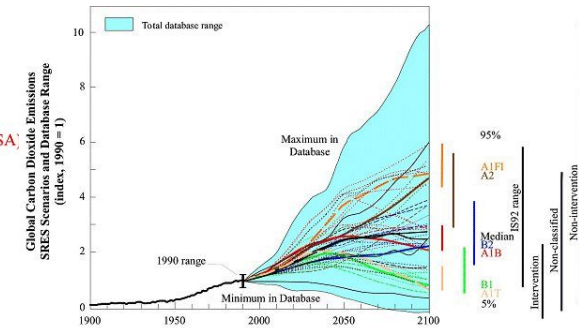

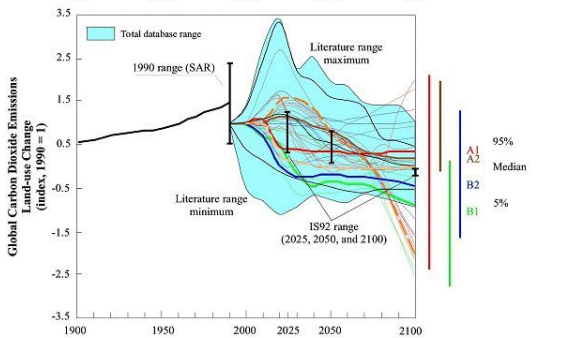

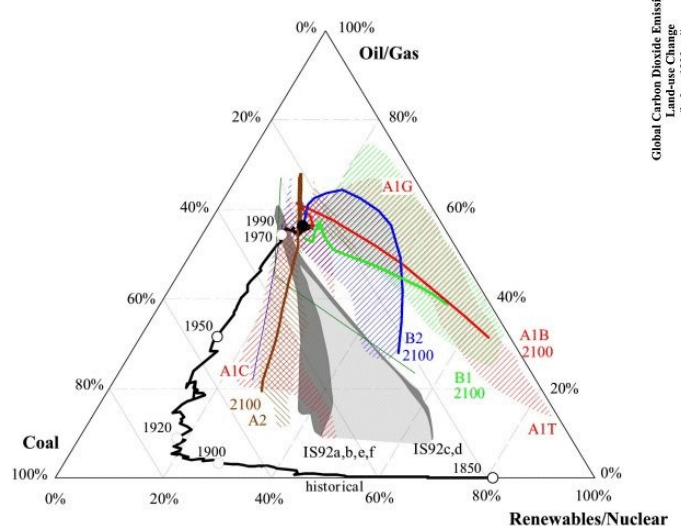

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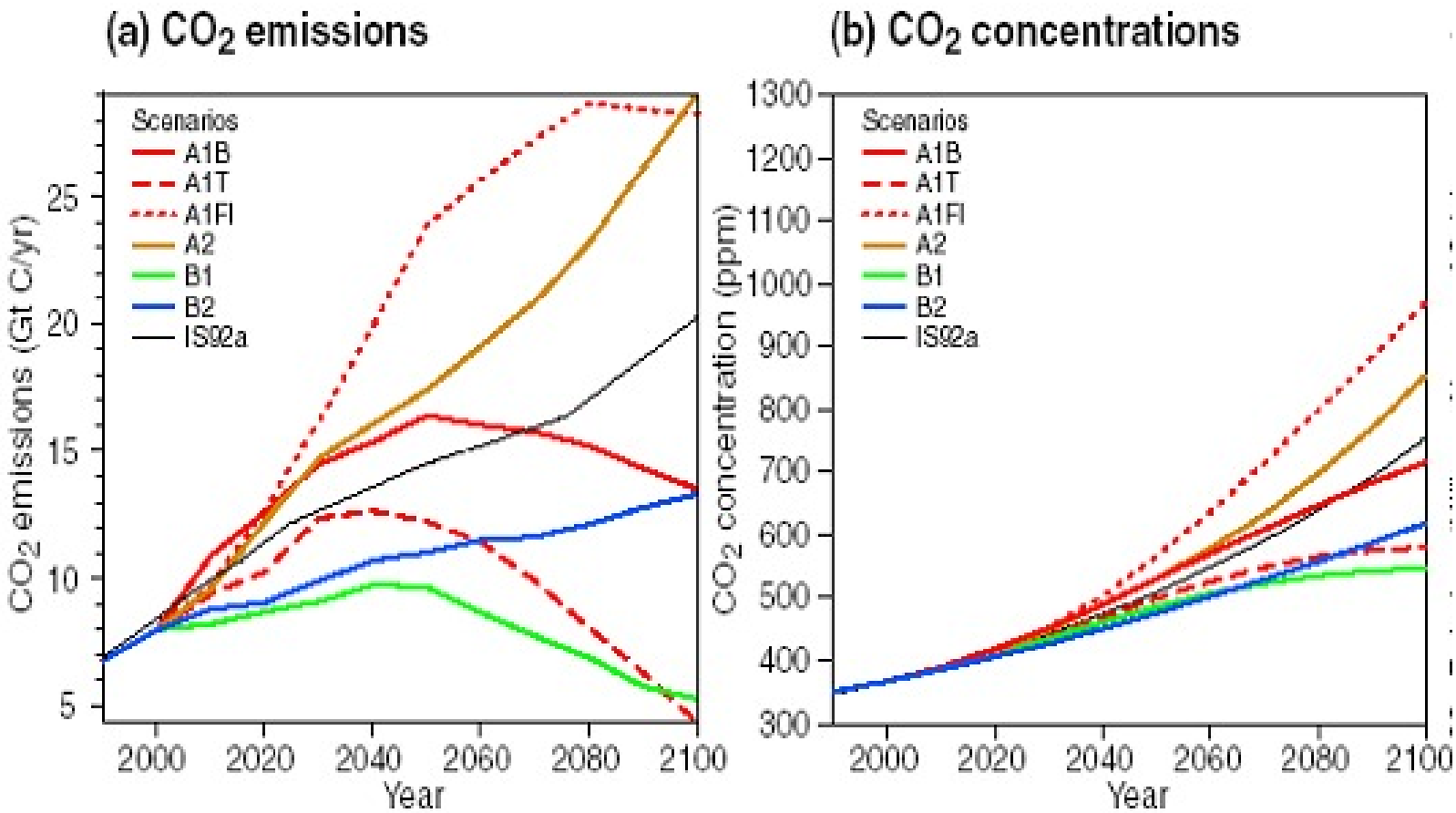

Current Modeling Status

LIMITATIONS

- Lack of sufficient interactions and feedbacks (physical, chemical and human) mechanisms
- Not well reproduce local and temporal weather events/phenomena, e.g. El Nino, IOD, MJO, tropical storms, etc.
- Difficult to mainstream into development agenda

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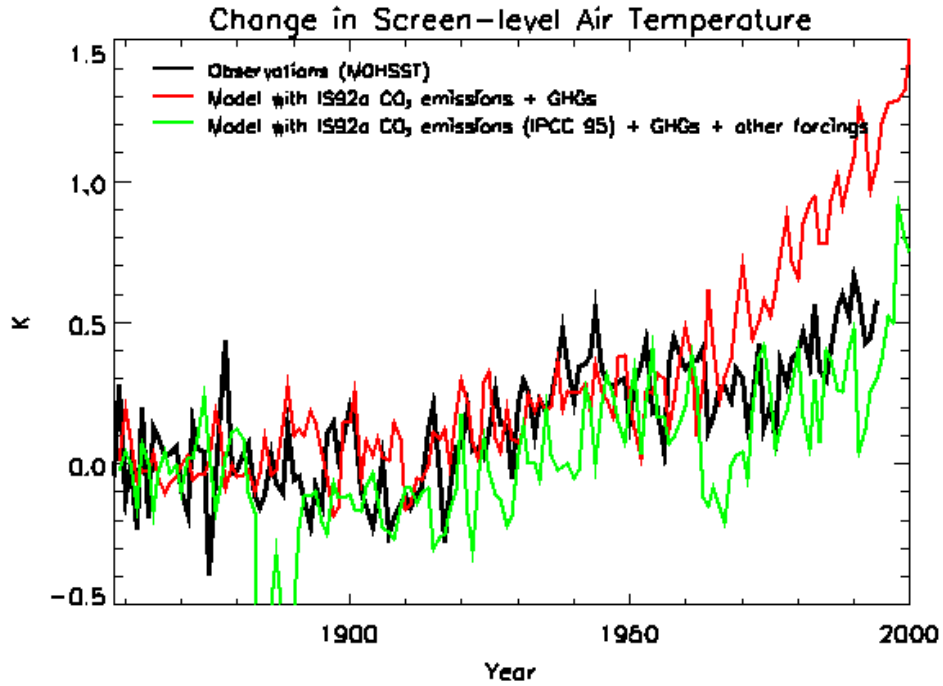
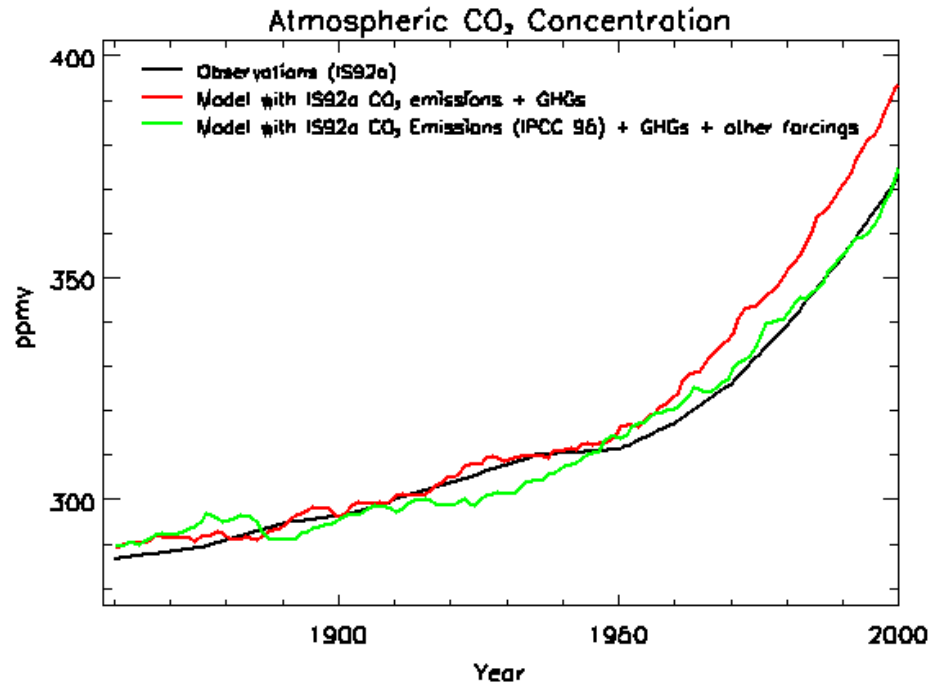
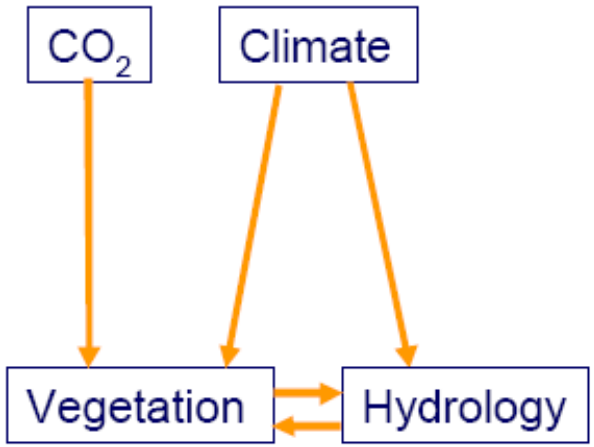
Overestimations of historical temperature and atmospheric CO_2 trends could be solved by adding feedbacks such as aerosols and carbon uptake by forests





Additional Feedbacks

- CO_2-Plant-Water interactions



- Plant-Ozone interactions

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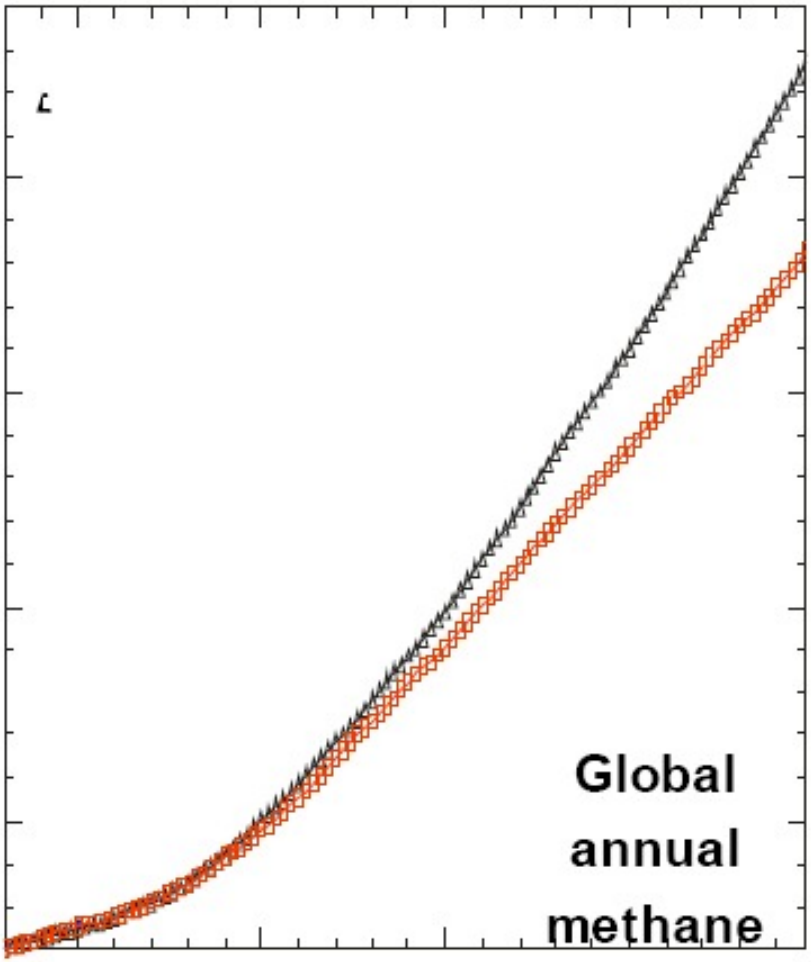
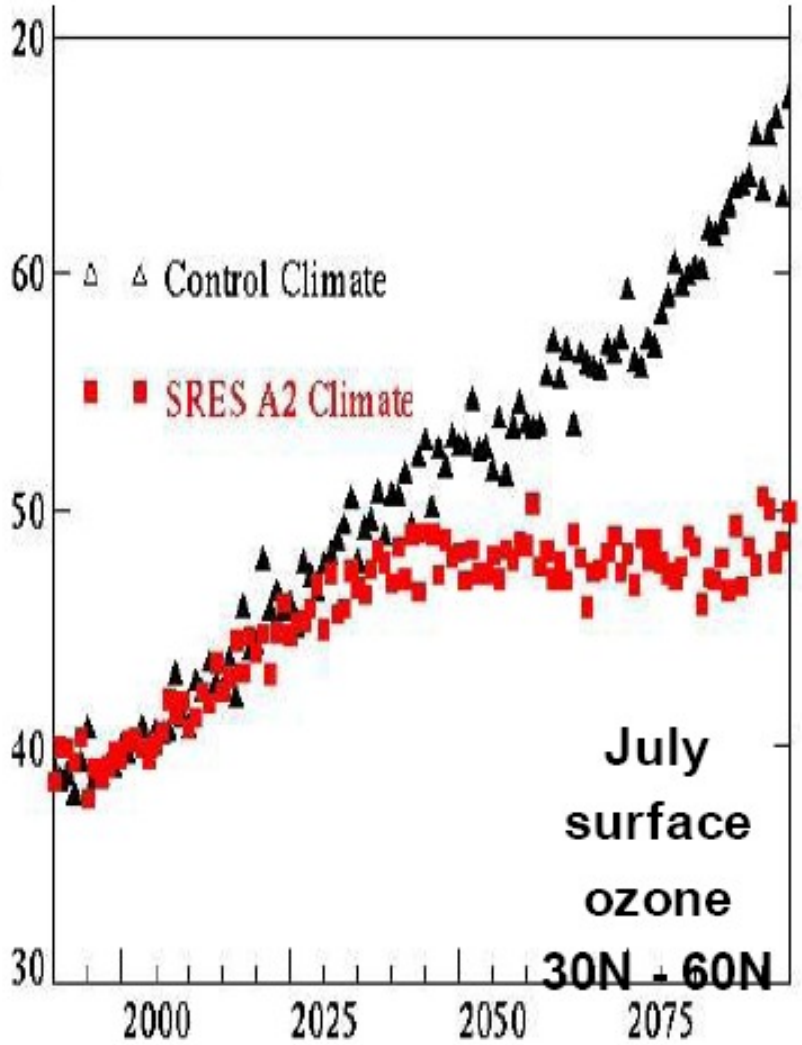
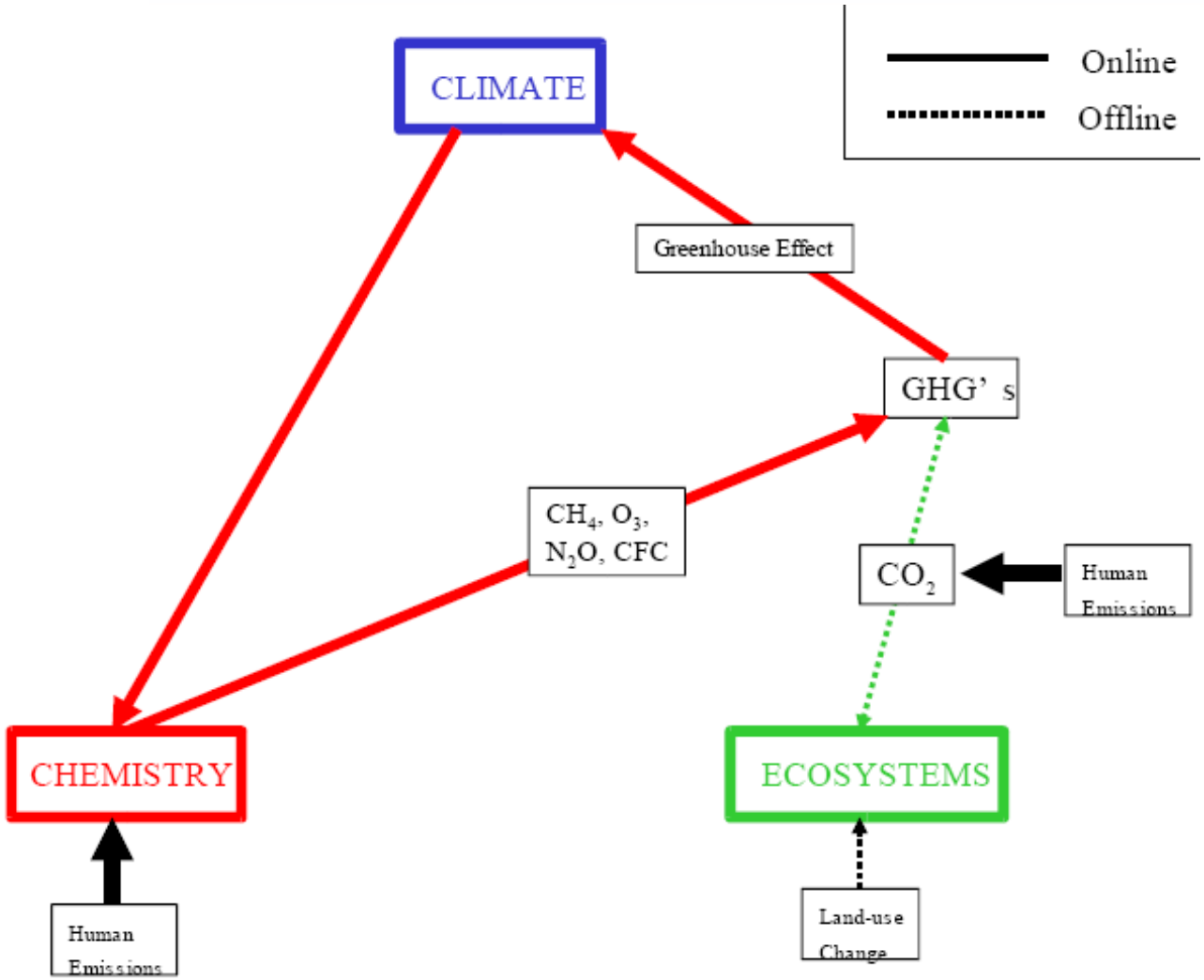
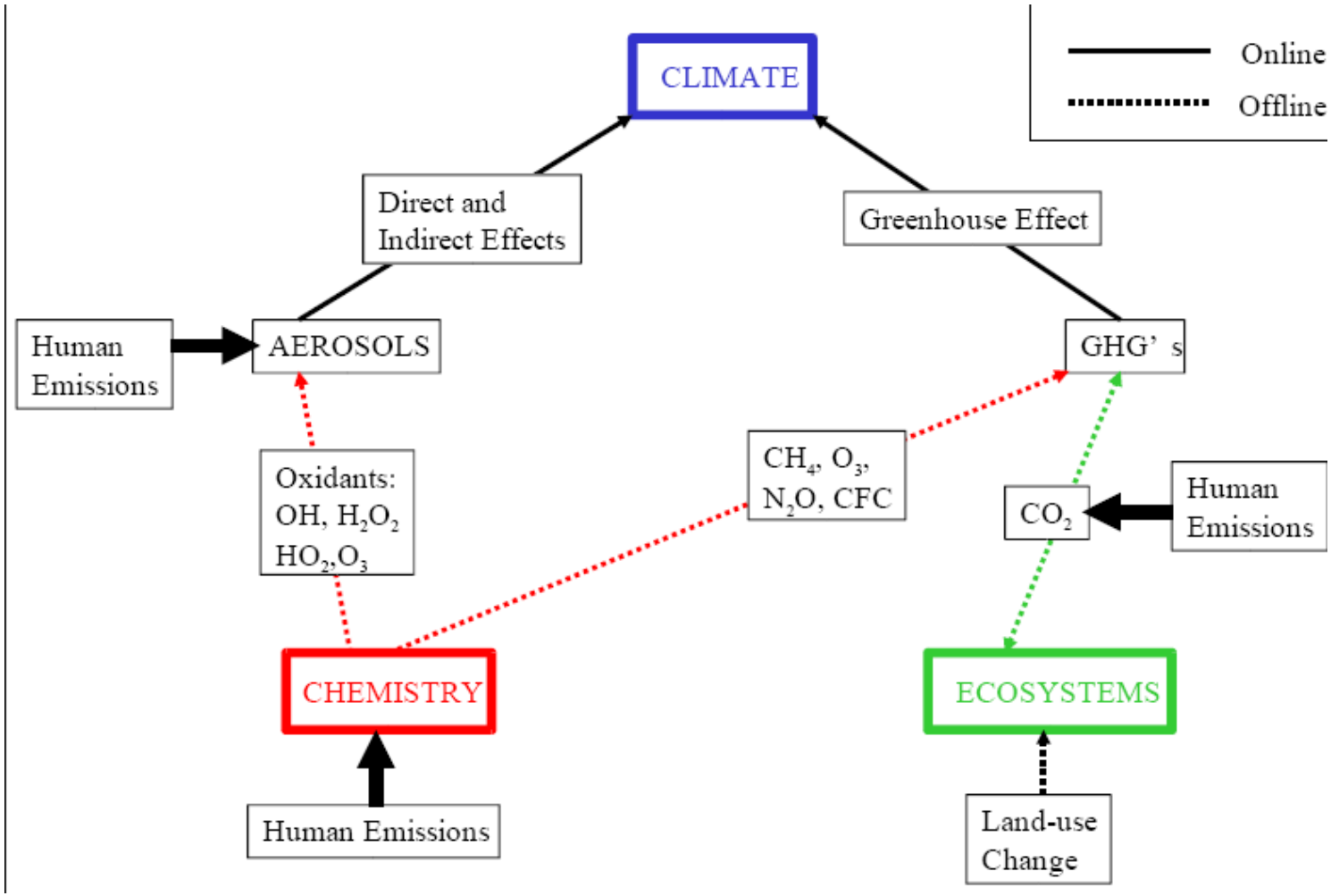




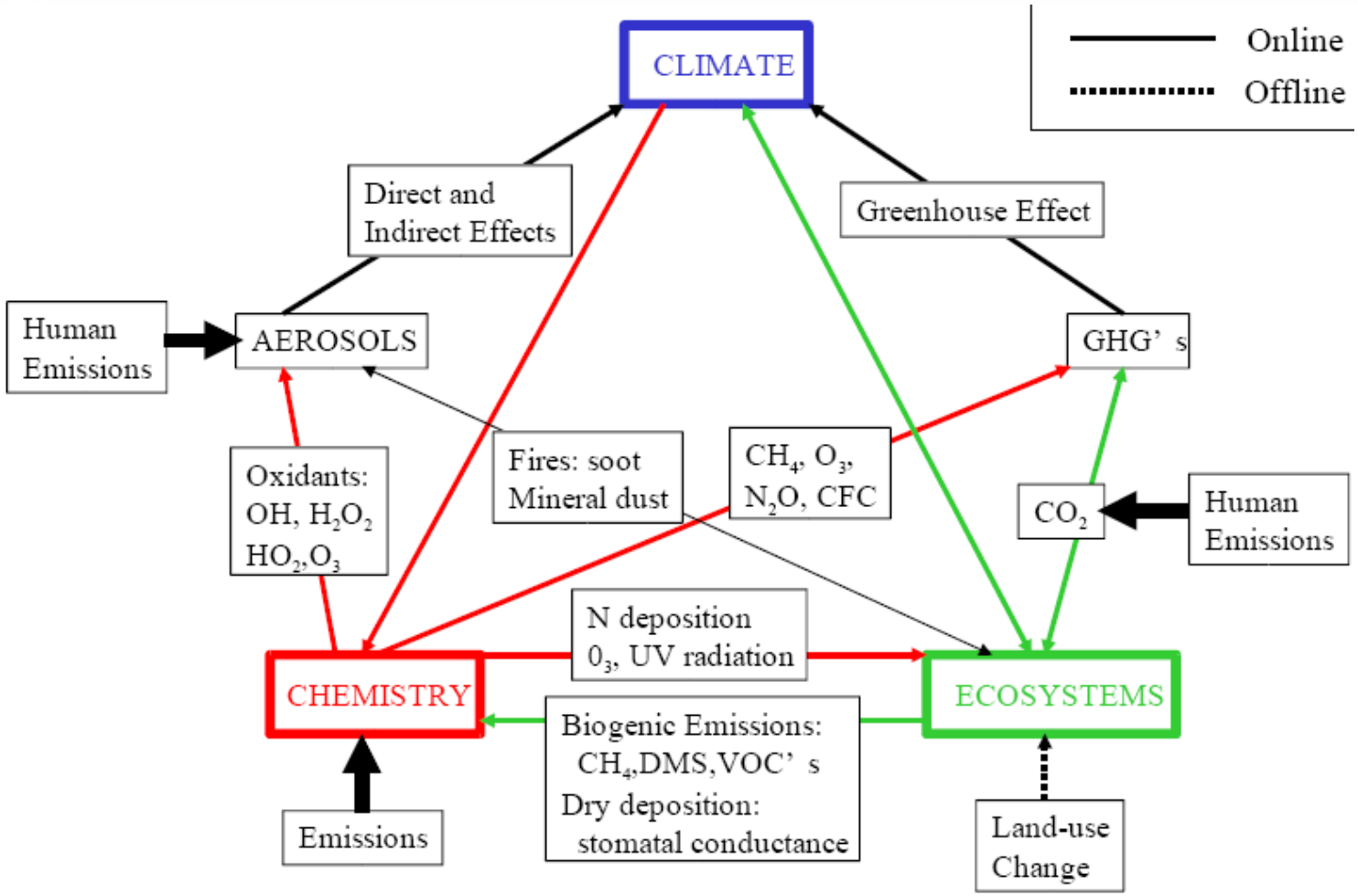
Climate-Chemistry Coupling Models



Climate-Chemistry-Ecosystems Coupling Models Used in IPCC 4th Assessment Report (AR4), e.g. HadCM3



Planned Current Climate-Chemistry-Ecosystems Coupling Models for IPCC 5th Assessment Report (AR5)



Earth System Models (ESM) for AR5 will also feature

- Vegetation/ecosystem dynamics (terrestrial and marine)
- Non-sulphate aerosols
- Ozone and other oxidants (in situ aerosols and methane reactions)
- Sea ices
- Stratospheric processes (~100 vertical layers)

New GHG Forcing Scenarios

WHY NEW SCENARIOS

- The current SRES used for worldwide assessment were constructed in the late 1990s
- Many underlying data for the scenarios are outdated
- Integrated Assessment (IA) models that produced the SRES scenarios have advanced
- Scenarios need to consider non-homogeneities such as
    - Sectoral and spatial emissions
    - Land-Use and Land-Use Change

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- Development of “Representative Concentration Pathways (RCPs)”
- Climate and Earth-System Model (CM/ESM) will use these RCPs to generate outputs to be used for vulnerability and adaptation (V&A) analysis
- Integrated Assessment Models will match RCP results with socio-economic costs and benefits

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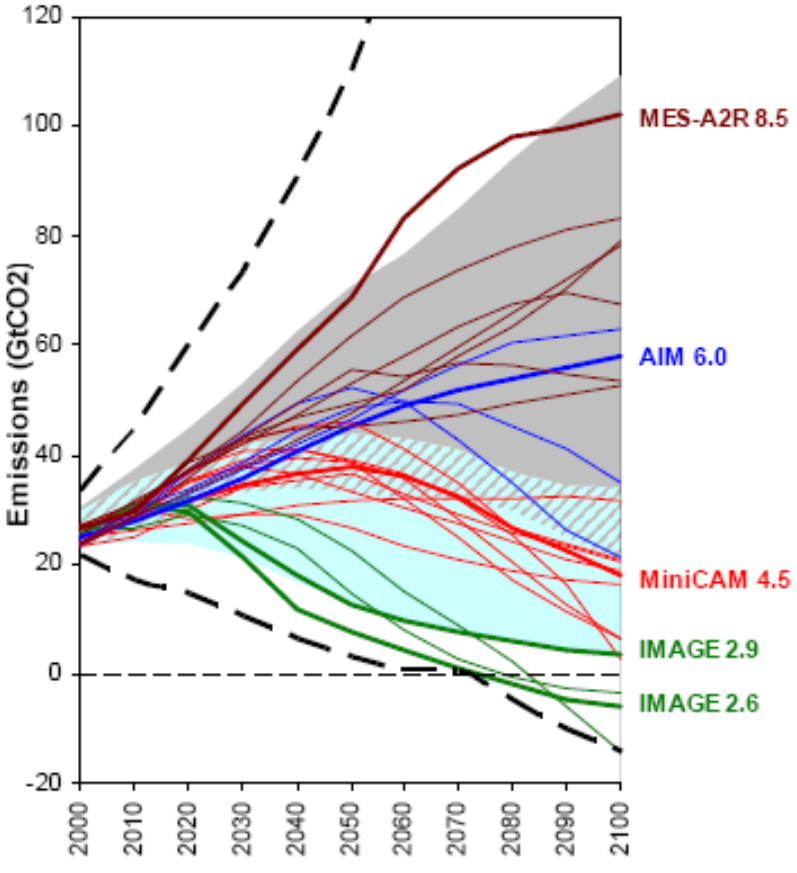
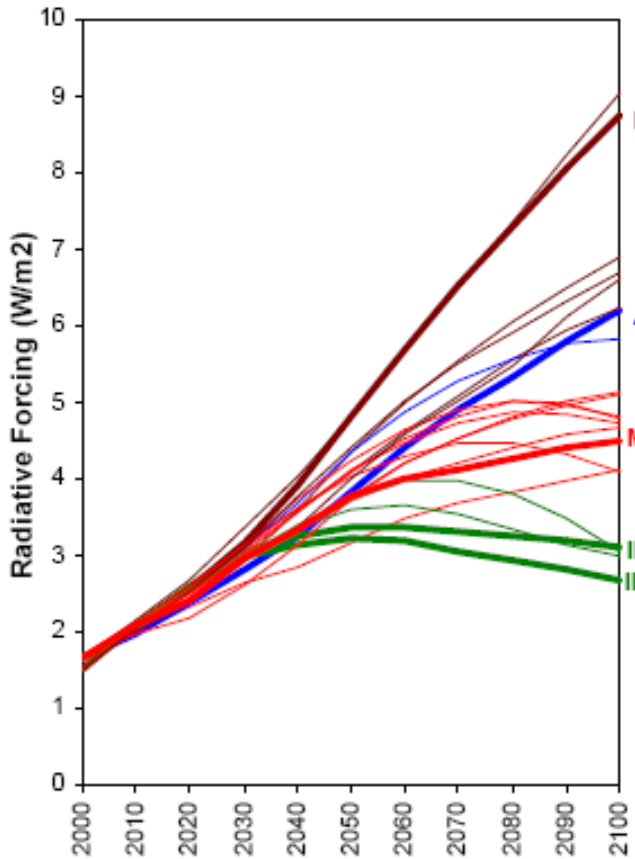




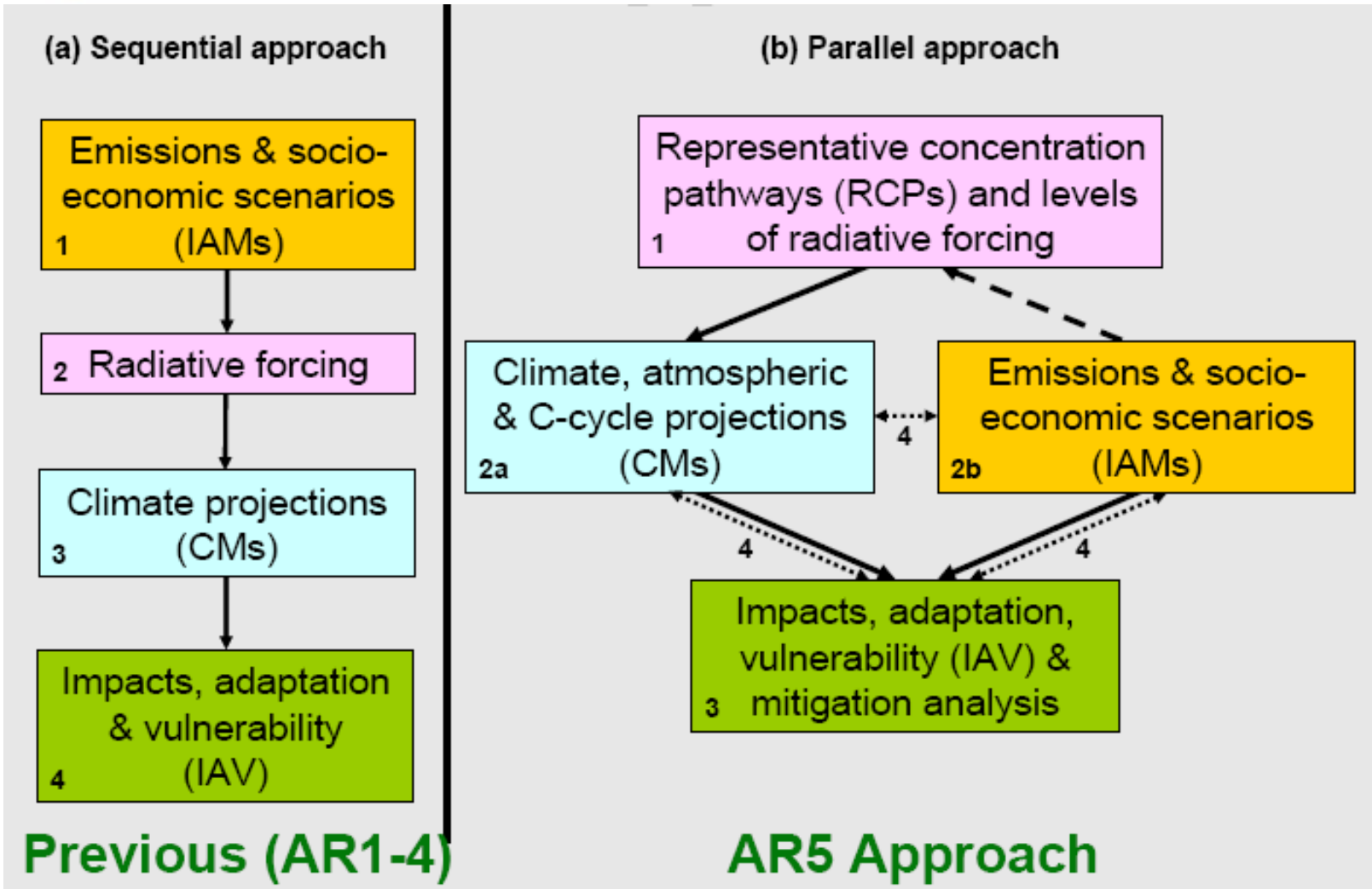
RCP8.5

RCP6

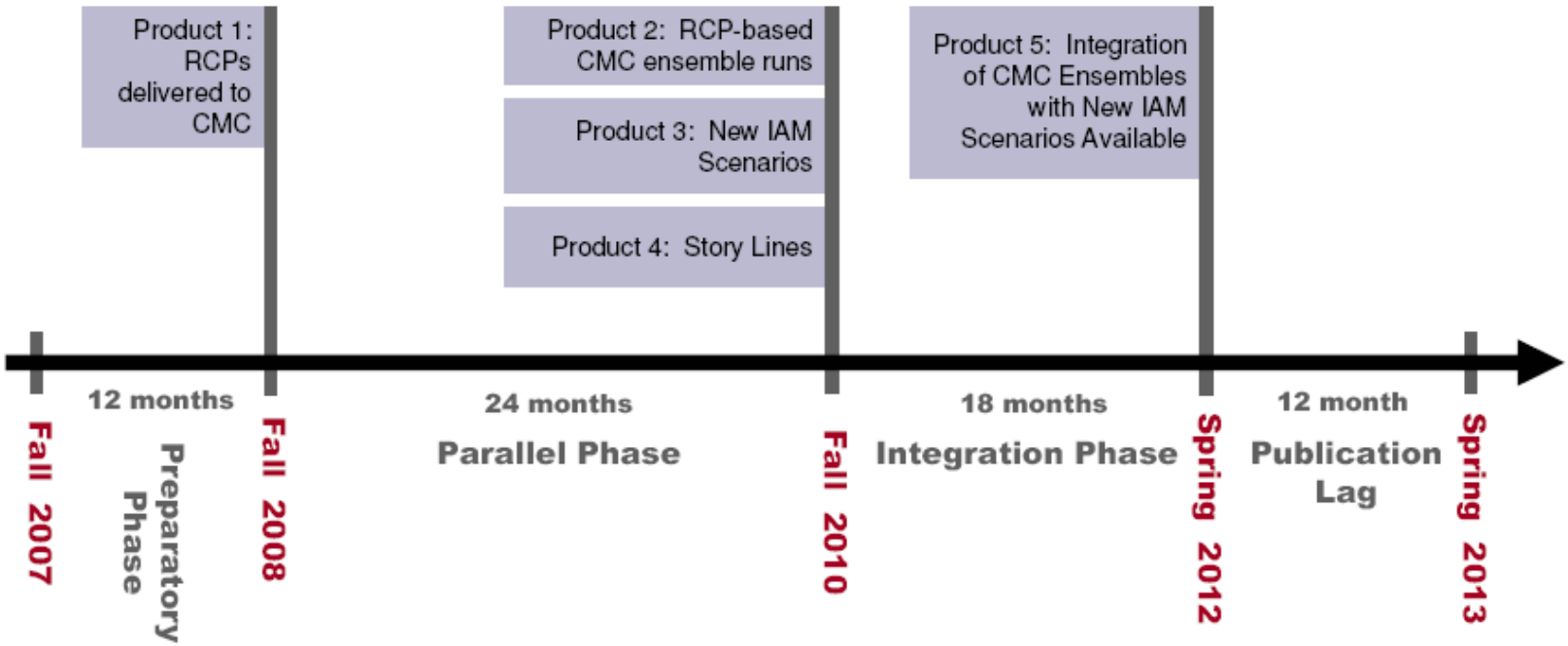
RCP4.5

RCP3-PD

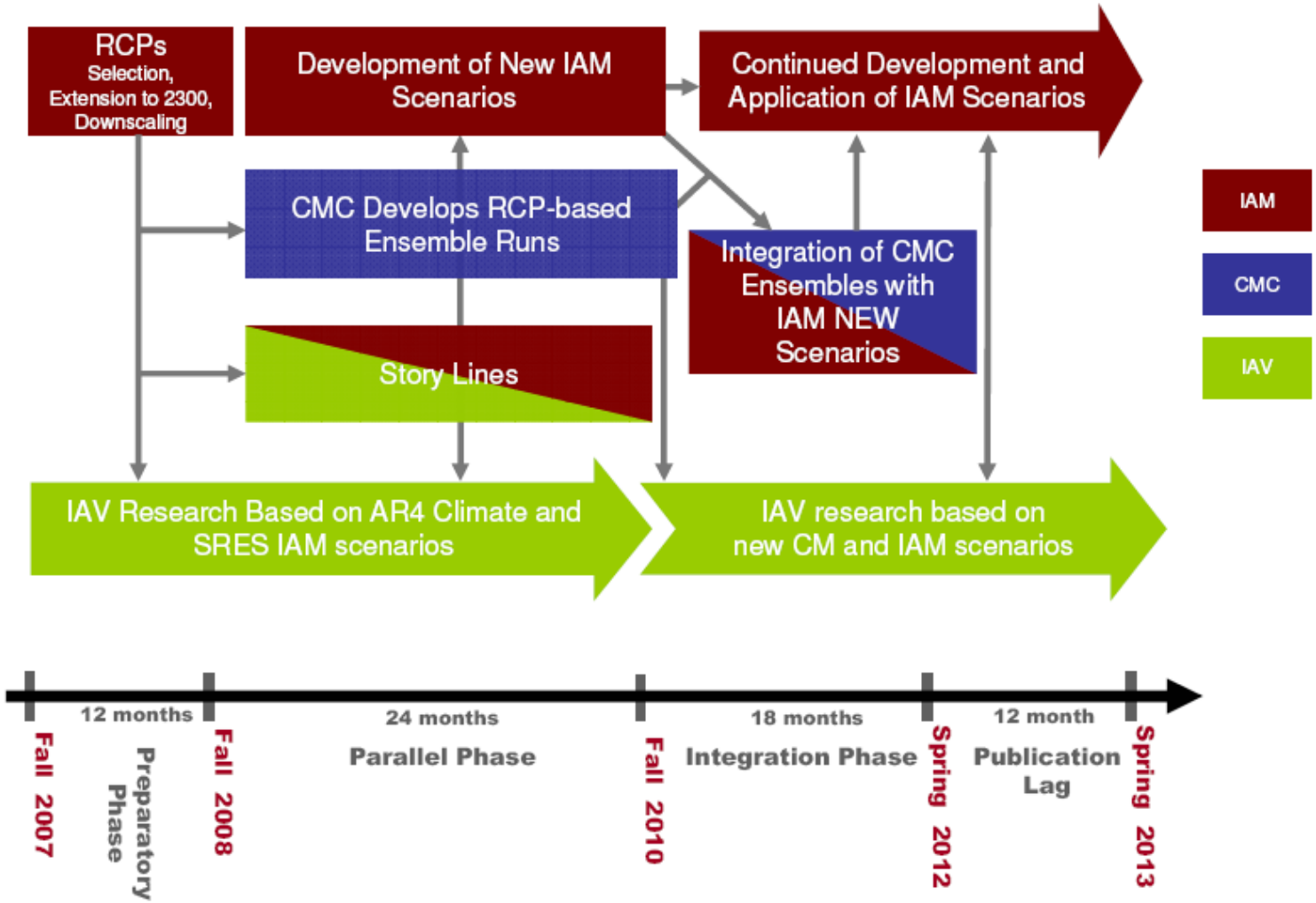
Name	Radiative Forcing	Concentration	Pathway shape
RCP8.5	>8.5 W/m^2 in 2100	> ~1370 CO_2-eq in 2100	Rising
RCP6	~6 W/m^2 at stabilization after 2100	~850 CO_2-eq (at stabilization after 2100)	Stabilization without exceeding target level
RCP4.5	~4.5 W/m^2 at stabilization	~650 CO_2-eq (at stabilization after 2100)	Stabilization without exceeding target level
RCP3-PD	<3 W/m^2 in 2100	< ~490 CO_2-eq in 2100	Peak & decline stabilization


(a) Sequential approach
Emissions & socio-economic scenarios (IAMs)
1
2 Radiative forcing
Climate projections (CMs)
3
Impacts, adaptation & vulnerability (IAV)
4
Previous (AR1-4)
(b) Parallel approach
Representative concentration pathways (RCPs) and levels of radiative forcing
1
Climate, atmospheric & C-cycle projections (CMs)
2a
4
Emissions & socio-economic scenarios (IAMs)
2b
4
4
Impacts, adaptation, vulnerability (IAV) & mitigation analysis
3
AR5 Approach

Timeline of key scenario development products



Time Line & Critical Path of Scenario Development



Deal with Uncertainty via Risk Management

- Vulnerability vs Impact Assessment
- Climate or Earth System Models will not give answers on what systems and sectors should do
- Systems and sectors need to have their own visions on what they want to be in the future and CM/ESM may give indications if such vision can be achieved under future climate regimes