### PARTICIPANTS

**AIMES SSC MEMBERS:**

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<td>Bob Costanza</td>
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<td>Natalie Mahowald</td>
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<td>Colin Prentice</td>
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**Non AIMES SSC Participants:**

- Stephen Plummer (European Space Agency; UK)
- Young Scholar’s Network Participants (Global)
- Eric Wolff (PAGES; UK)
- Darla Munroe (Remote Sensing, USA)
- Kevin Noone (IGBP; SE)

**Invited but did not attend:**

With regrets: Anond Snidvongs (Indonesia), Jérôme Chappellaz (France), Congbin Fu (China) of the AIMES SSC and Carlos Nobre (IGBP-SC chair; Brazil) were unable to attend.
5 June, 2007

**Dave Schimel** provided some background on an Applied Earth System Science (AESS) and Integrated Earth System Science (IESS) strategy from the IGBP SC meeting in Pune (2006) towards the evolution of a next phase for IGBP, currently coined as IGBP 2.5. Carole Crumley suggested that a merge of PAGES and AIMES might be an agenda item however, Dave cautioned that one single programme is not necessarily the answer; a monster may be formed. A merger of programmes may be also perceived as a threat to the smaller, younger programmes (IHDP, DIVERSITAS), but this doesn’t appear to be the case. The progress of an IHOPE Secretariat in Stockholm at the Resilience Center can facilitate some of these activities; and this progress is a great way to collaborate with other projects.

**Stephen Plummer and the European Space Agency (ESA);**
Projects discussed included GlobCarbon, Leaf Area Index (LAI) and Fire incidence product that provides data on burned areas, GlobAerosol, and GlobCover (a global land cover map following an FAO mapping scheme resolution of 300m from 2005 with capability for regular updates at relatively low cost). The GlobCover has produced a demonstration using 2005 map that can be viewed at: [www.esa/iont/due/ionia](http://www.esa/iont/due/ionia) and [www.globcover.info](http://www.globcover.info). GlobCover will eventually be available on 2 monthly mosaics.

In addition, Stephen provided an overview on products that are under consideration including:
- GlobColour; ocean photosynthesis/productivity
- Mespiration; SST at very high resolution: primarily in Mediterranean, but possible to build upon;
- Fire Atlas; with ATSR at night.
- GlobModel; defining a strategy for Earth Observation Assimilation; how best to tackle the issue of Earth Observation data assimilation in all forms of models. Potential new projects:
  - GlobWater: global wetlands,
  - GlobWave: wave height mapping
  - Permafrost; changes in permafrost distribution
  - Urban heat islands
  - Albedo

Stephen encouraged the SSC to contribute ideas to ESA for remote sensing data products.

**Pierre and C4MIP**
Pierre showed results from Chapter 7 and 10 from the 4th Assessment Report (AR4). A primary consideration in the current IPCC runs was to reduce uncertainties: with respect to atmosphere in CO$_2$; offline transport over 1979-2003; coupled models and compare CO$_2$ simulated in atmosphere with observations for last 25 years (Cadule et al. in prep). IPSL and Hadley groups have looked at flask site stations: Mauna Loa, Barrow and Alert interannual and seasonal signals. They have also looked at flux net at Harvard and currently looking at regions from TransCom expt #3. Work in progress includes looking at the change in the northern hemispheric spring LAI with Orchidee from (Piao et al. GRL 2006), as well as attribution of northern hemispheric (NH) spring LAI, and investigating in the seasonal changes in fall C-cycle;
DGVM benchmark exercises include the European models Orchidee, LPJ, Triffid. Pierre also discussed the C4MIP links with the Carbon-Land Model Comparison Project (C-LAMP) at NCAR. Additionally, C4MIP is working on issues regarding ocean model validation, where climate driven trends in contemporary ocean productivity; driven by low latitude oceans; Behrenfeld et al. Letters 2006, and Schneider et al. 2007. Reasons for correlations and variability are different between the models (Laurent). Two additional activities: C4MIP to implement CMIP protocols including stylized 0.5%, 1%, 2%/year increase in CO2 and other non-CO2 greenhouse gases (GHG) and aerosols in the future. Next steps: AR5 strategy; Validation C4MIP/ C-LAMP; CXMIP. For instance, investigating tropical variability: ENSO on PSN, Fire ?? Models aren’t doing tropical processes correctly. Some years, with big fires, really see a difference.

Bob Costanza: Modeling Ecosystem Goods and Services:

Brief update: Multi Scaled Integrated Models of Ecosystem Services: MIMES Difference is integrating with models

Using Simile software: http://www.simulistics.com;
MIMES as scalable; local to global;
If calculating ecosystem services; need to know where they are, relative income level; storm protection; to be of value for storm protection, coastal wetland has to be in the right place with respect to population center, how much, worth of infrastructure; cultural ecology datasets are out there, but wouldn’t be impossible; insurance companies!!! They MIGHT let us run the model and produce their aggregate database without releasing underlying data. Smallest scale would be; trying to design the model so it does apply to smaller regions

6 June 2007
Mat Williams and the Simple Mitigation Model (SIMM) exercise:
Simple models provide an interface with global models to more detailed human processes.
Simple terrestrial model; (e.g., the breathing forest: http://www.sei.se/forests/breathingforests.htm). Need an equivalently simple ocean, simple atmosphere-ocean and simple socio-economic model to couple.
Questions the model may pose include: What are the costs of policies, what are the costs to economies; what are the teleconnections between countries, sectors; what are the offsets and feedbacks; these are not meant to be predictive, but to enable question asking and probing. Particularly in the wake of the Stern report (released this week), could add discount rates, etc. Bob Costanza: Perhaps an issue to tackle is one of scaling and complexity as an AIMES activity; there will always going to be a country-level issue for policy makers; a model with multiple resolutions to compare:
Dave Schimel: the question with these simple models is: what questions CAN be addressed?
The beauty of a model like what mat showed can be used for flux tower or up. What are the equivalently aggregated boxes of an economics model for those aspects that affect the carbon cycle? Classic economics as energy of zero-order; peak oil model assumes first order reaction where economics are very dependent on size of the compartment.
For instance: what are the dependent variables of comparable complexity be for a social model? The point isn’t that the models don’t exist, they haven’t been integrated; what questions do we want to explore; thinking about what to keep in and throw out to represent the appropriate behaviours; it’s the model-building process; the collapse of the Soviet Union or gas embargo of the 70’s wouldn’t show up in this model. Having equal ‘quality’ of expertise on all sides of the table in a model-building exercise is essential.

The model is not the answer to the question, the building of the model is the beginning of a dialogue that is interactive and collaborative from the outset to develop a common vocabulary as a foundation for building ‘operational’ models. It’s not to build a model, gaining an understanding of the commonalities and nuances in a pragmatic and mutually productive manner. This exercise would also lead to a non-trivial and productive discussion about scale; at what scale do landscape biogeochemical and physical models and at what scale are human landscapes variable? Boundaries are tough – imports, exports, global markets. It’s always been difficult to match scales between ecological and human processes…..understanding the sensitivities might help with understanding the dynamics and linkage points of the system. What would be the question: how do we reach stabilization – will deforestation, fossil fuels?

What are the drivers to the consistent growth trends in global economics? It’s a what-if question; another interesting question is the Aspen Protocol question; a suite of concentration scenarios that are at least consistent with policy (not necessarily economics) and then we want to understand the family of economics to achieve those emission scenarios; what sort of economic model could one use to tease that out? The MIT group uses their model for these kinds of questions. What connections of parameters pass through various checkpoints.

If you’re at 2075 or 2080 what sort of economic situations and technologies will be necessary for a fraction of current emissions? That conversation needs to happen soon; perhaps use TAR or AR5 or Koala results and start using those results (use Wigley, Richards, others) results; there will be a spatial pattern of ocean and land fluxes with global emissions; the difference is that with the coupled models we have geographically varying climate; cost of mitigation strategies; variable scenarios to explore with respect to mitigation and policy strategies. Today’s spatial patterns of emissions and scale down in many ways through offsets, trading. If you want to get below 1 Gt, what does that imply for the cost of transportation? This puts limits on technology…..these are the kinds of questions to begin exploring. Can start to build the analysis tools. The numbers can be incredibly powerful;

This discussion is absolutely within the scheme of an AIMES strategy. Waiting for AR5 to go to completion won’t have time for this kind of analysis. Perhaps also a mechanism to enhance development of IA models for impacts and adaptation.

A proposed strategy:
Is there any way keep on this trajectory – keep Bush forever; or is there any way to keep on this trajectory involving only the Bush 15, or only the economic efficient route through emissions from developing world. Then, ask about the economic implications about how to partition emissions amongst the various sectors. We could have in place the spreadsheets to do this sort of
analysis ready by the time the first aspen procol results are available ca 1 year from now. Can practice on results from simple model exercise.

MAJOR TOPICS DISCUSSED IN PLENARY:
IGBP/WCRP Merger;
AIMES has been successful with both other IGBP core projects (CPs), several WCRP activities and on some level with IHDP. We should think about where we would want OUR science to be 5,10 years from now in terms of an international organizing framework. How we would like to see global earth system modeling and analysis in a larger context.

Discussions revolved around the dichotomy of a small and agile vs monstrous talk shop; the development of large intellectual charges for integration may not be the answer.

Carole Crumley proposed a flatter political landscape with networks rather than a pyramidal one. A flexibility should be considered to account for new ideas; nodes and connections can come and go; a nodal structure; perhaps one network with more projects that is more integrative and more focused than the current suite; a network of large projects say, under SCOPE or ICSU; Claire Granier suggested that a new Global Environmental Change Programme (GEC) be flexible, and to pick the projects that naturally evolve; a bit like the fast track on a longer time scale. The rest should be networking.

Effective programs with leadership and less investment, say through project offices that support activities that are bigger and fewer than the current IGBP/WCRP core projects and more integrative. An intellectual merger, perhaps go from 9 in IGBP plus WCRP to end up with 6-7 merger activities that are somewhat more inclusive than what we have now.

Applied ESS and the IGBP
Regional scale is a natural scale for interaction with many IGBP core and other project analyses, applied where the science is going and the attitude of the development agencies; developers on place-based rather than regional. For instance, the problems exist with mis-use of nitrogen, managing air quality. The central challenge is not reducing the granularity of the knowledge from regional to local, problem is that the issues need to be considered from regional and larger; if you don’t manage N at the regional scale, you’ll fail. It’s the place-based approach that needs to be challenged; how to take a regional approach to the development entities (e.g., World Bank).

How to develop a workshop proposal; regionalization of project activities for perspective; drought at regional patterns not really believable; details of where storms go, etc will always be statistical; if a regional approach is needed, must enter the development scale of problems into as well. Maybe draw in PAGES with a wealth of regional climate history.

The gain of a massively downscaled regional climate model doesn’t really amount to much – many of the climate issues have large scale signatures. It’s not appropriate to think of a global number and not a complete kaleidescope; risk of change between changes in biome shifts, freshwater supply; take home message: there is a LOT of information that is complicated to extract from literature and IPCC; needs to be synthesized down; if interested in a region; the regional patterns show up, e.g., Scholze et al. PNAS 2006
Applied ESS and development issues one aspect to pursue; one of the places we started this conversation was the idea of having a more concrete focus within AIMES on climate change impacts. Clear link between climate change impacts and development; climate proofing (drought, farming). Also seems in the spirit of knowing your customer that there is a real gap in that there’s not a coherent research programme that the IPCC WGII works or interfaces with.

There are several open niches; one is more coordinated work on climate change impacts; it’s a highly fragmented field and less well supported.

Kevin Noon provided an update on Earth System Science Partnership (ESSP) involvement with development agencies and the COP SBSTA. The international process is a relatively easy customer; linking into adaptation and mitigation community is even harder. Partly because we don’t know what to tell them when we want to talk; there’s a need for a safe and authorized conversation. We have to do our homework before we go off and start something. We need to get together with people that know what are going on with development; people from World Bank and agencies to listen and be helpful. Also need to include people from scientific communities who have worked in the development area. Two or three concrete ideas that we might be able to talk to development agencies: climate proofing through statistical methods; addressing multiscale problems, e.g., nitrogen pollution; carbon management and economics--scientifically rigorous methods of assessing carbon management at relevant scales. But, not the whole gamut; put a few things on the table and see where things go. Talk about it, try it out with people that are knowledgeable before we try and have any interaction with a development agency. There’s a vocabulary and language issue that we will need to be careful of.

Who is “WE’ – if we include WCRP, then seasonal forecasts are high on the list; Dave’s interpretation is AIMES acting on behalf of IGBP – with GECAFS and GC – the link with AIMES are to identify what the modeling needs are. For instance:

- We (IGBP community) could already do a lot with respect to biofuels for others, say, nuclear it would mean turn off CO₂ emissions;

The AIMES SSC noted that the notion of ‘climate proofing’ is appealing; it’s a risk management; the message from the development community is that climate proofing is something they’ve accepted. However, we will have major impacts. There’s also the issue of adaptation, fractional conservation; see this in water schemes in the water world – costs of increased storage vs. increased efficiency in CO. The whole issue of carbon permanence and the impact of climate change on the permanence of carbon storage.

June 7, 2007
**Continued discussions on Applied ESS:**
Colin volunteered to lead a short workshop on Applied ESS; people who do emissions from industrial, people who do the land use modeling and people who do the impacts people. There are institutional as well as communication barriers; impact people want output from the models that are not NetCDF format, something understandable. Doing file conversion for impacts
communities is one institutional barrier; the emissions community is better integrated. There’s an interesting dichotomy between the scientific and policy communities with respect to developed and developing countries. One is almost completely decoupled and the other are very closely linked; maybe not developed vs. developing, but there is a continuum of models of scientific coupled to policy communities.

Discussion about relationship with PAGES

• PAGES Open Science Meeting, Spring 2009 in US;

Roles of AIMES and PAGES; the two integrating projects in IGBP that are concerned with Earth system-wide projects. AIMES and PAGES: an increasing focus on last 1-2,000 years and with CLIVAR; the PAGES/CLIVAR intersect (reconstruction challenge). Three parts: paleomodeling (e.g., EBM, EMIC, AOGCMs); second; pseudo proxies and 3: reconstruction (e.g. Michael Mann, the Bern model approach). The PAGES-IHOPE intersect is the PHAROS-John Dearing and Rick Batterbee. Regional climate variability – from PAGES this is a strong need for IHOPE; seasonal back to 1700, 1750, at least annual back couple of thousand years. A new synoptic analysis.

Perhaps try to model the proxies directly with new ESM models to test: dust is another example that is misused and used incorrectly. C4MIP could be the mechanism for this Need to develop a standard methodology for model-data comparison; as a function of model class?

Eric Wolff:
Presented DESIRE; dynamics of earth system models in the ice core record. Coupled AOGCM and carbon cycle ESMs in PCMIP; new developments are tested against component models. Land and carbon cycle run offline;

Two key sources of information: one from bulk of information from various proxies synthesized over decades; together it’s a huge resource of spatial patterns and response to long-term changes Need a synthesis of a great mass of data; There is also a substantial body of data with higher resolution and dating precision.

Recommendations

Discussions and updates suggested the following recommendations and/or considerations for future AIMES activities and memberships:

1. Discussions during the SIMM activity points to an AIMES SSC member that is more of a quantitative economic; on the impact and economic side; a separate model for ecosystem services; biodiversity; a need for a simple counterpart for oceans/atmos-ocean.

2. SIMM discussions also proposed An interim report to IPCC one year – our first customers are colleagues in WG 1,2,3 and UNFCC COP process (rather than national govts). First target is the international process. Perhaps discuss how to implement this set of activities: 1. constructing simple models; start from aspen protocol and then ask questions about the implications in terms of emissions and economics of mitigation
2. exploring emission consequences global scale climate impacts associated with various scenarios; These two activities should be regarded as two separate tasks; they could proceed in parallel, they don’t need to be sequential; energy and opportunities more the constraints. This is something that AIMES could push as an internal fast track activity. Also need to recruit someone from energy policy and economics to do calculations; Denise can approach the Princeton Group; Energy or OECD modeling skills would be helpful. Also need to consider memberships from the World bank, FAO, to get the credibility, will need these kinds also MIT and other integrated assessment modeling (IAM) groups. Need to identify a point person or persons within AIMES to push this; Pierre, Mat, Suzi, Denise. We should be considering an IA and economic modeler on the SSC.

3. During the Applied ESS discussion, the AIMES SSC felt that there was a potential of having a coherent partnership with WGII – current rendition is a vast improvement, but still lacks coherent application of a consistent framework across regions; consistency with respect to tools, etc. Not only do the models not agree, but the climate impacts people don’t agree on which models to disagree on. The group proposed a proposition on a climate impacts group; that would embrace biogeochemical coordination with impacts communities. Could coordinate IGBP activities through AIMES with WGII; we want to be sure that we are doing something that will be useful; Additionally, if AIMES and/or IGBP is to open a dialogue with UN groups, (e.g., World Bank) and/or national development agencies, it should be done strategically. Would be pretty easy to get off on the wrong foot. This points to an eventual connection with an AIMES SSC member and someone who has worked in/with development agencies and the scientific communities in their career.

a. It was suggested we need to have a small AIMES-led workshop bring some in from GCP, GLP, GECAFS, GLOBEC, former friends and students who work in these agencies (e.g., Denises’ first PhD). The UN agencies and CGAIR are also relevant.

b. Dave Schimel and Kathy Hibbard to push forward: Dave to write a concept paper; also bring into this people who have worked in development: e.g., Bill Parton, Robin Reid and Nial Hanan at CSU. Also Johann Rockstrom, the Stockholm Resilience Center director. Identify also some key people and other core projects and ESSP: Carlos can also help (also Paty). Luiz to contact Matete (coordinator with INI); Mary Scholes another person to talk with. Not a lot of people from the development side; need IGBP people primarily to start setting a stage and a paradigm.

c. Again, it was clear that the AIMES SSC needs a quantitative economist energy person, perhaps an IA modeler, someone from WG2 and WG3.

4. QUEST will be hosting an Open Science Conference in 2010 Perhaps joint AIMES/QUEST?
5. With regard to an AIMES OSC, perhaps an integrative and applied ESS OSC that highlights AIMES and its collaborative activities with the other core and ESSP projects.

6. Eric Wolff suggested a PAGES/AIMES synthesis of bulked and high resolution paleo datasets