**In-class project topics reading list**

***Note:*** *this reading list serves only a guide. You do not need to present on all these papers but you should use them as a guide to what type of topics to present in your review and presentation. You should actively be looking for other papers from which you can learn about your topic. Graduate students in particular are strongly encouraged to do a literature review beyond the papers listed here.* ***Please also see class notes for your topic for extra references.***

**G540**

**Dan Myers: Hydrology model data assimilation**

Raoult, N., Delorme, B., Ottlé, C., Peylin, P., Bastrikov, V., Maugis, P., & Polcher, J. (2018). Confronting Soil Moisture Dynamics from the ORCHIDEE Land Surface Model With the ESA-CCI Product: Perspectives for Data Assimilation. *Remote Sensing*, *10*(11), 1786. (plus refs 22-31 in this paper)

Scholze, M., Kaminski, T., Knorr, W., Vossbeck, M., Wu, M., Ferrazzoli, P., ... & Vittucci, C. (2019). Mean European carbon sink over 2010‐2015 estimated by simultaneous assimilation of atmospheric CO2, soil moisture and vegetation optical depth. *Geophysical Research Letters*.

Bonan, B., Albergel, C., Zheng, Y., Barbu, A., Fairbairn, D., Munier, S., & Calvet, J. C. (2020). An ensemble square root filter for the joint assimilation of surface soil moisture and leaf area index within the Land Data Assimilation System LDAS-Monde: application over the Euro-Mediterranean region. *Hydrol. Earth Syst. Sci*, *24*, 325-347. (and past work by this group, including paper below and papers by Joaquın Munoz Sabater, Clement Albergel, Jean-Christophe Calvet etc)

Muñoz‐Sabater, J., Lawrence, H., Albergel, C., Rosnay, P., Isaksen, L., Mecklenburg, S., ... & Drusch, M. (2019). Assimilation of SMOS brightness temperatures in the ECMWF Integrated Forecasting System. *Quarterly Journal of the Royal Meteorological Society*, *145*(723), 2524-2548.

**Ruhui Chai: Process-based GPP – leaf photosynthesis models**

Chapter 11 of the textbook and references therein, including most importantly: Farquhar, G. D., von Caemmerer, S. V., & Berry, J. A. (1980). A biochemical model of photosynthetic CO 2 assimilation in leaves of C 3 species. *Planta*, *149*(1), 78-90.

Rogers, A., Medlyn, B. E., Dukes, J. S., Bonan, G., Von Caemmerer, S., Dietze, M. C., ... & Prentice, I. C. (2017). A roadmap for improving the representation of photosynthesis in Earth system models. *New Phytologist*, *213*(1), 22-42.

Niinemets, Ü., Berry, J. A., von Caemmerer, S., Ort, D. R., Parry, M. A., & Poorter, H. (2017). Photosynthesis: ancient, essential, complex, diverse… and in need of improvement in a changing world. *New Phytologist*, *213*(1), 43-47.

Rogers, A. (2014). The use and misuse of Vc,max in Earth System Models. *Photosynthesis Research*, *119*(1-2), 15-29.

**Michael Benson: Plant Hydraulics**

Chapter 13 of the textbook and references therein

De Kauwe, M. G., Zhou, S. X., Medlyn, B. E., Pitman, A. J., Wang, Y. P., Duursma, R. A., & Prentice, I. C. (2015). Do land surface models need to include differential plant species responses to drought? Examining model predictions across a mesic-xeric gradient in Europe. (for context)

Medlyn, B. E., De Kauwe, M. G., & Duursma, R. A. (2016). New developments in the effort to model ecosystems under water stress. *New Phytologist*, *212*(1), 5-7.

Xu, X., Medvigy, D., Powers, J. S., Becknell, J. M., & Guan, K. (2016). Diversity in plant hydraulic traits explains seasonal and inter‐annual variations of vegetation dynamics in seasonally dry tropical forests. *New Phytologist*, *212*(1), 80-95.

Drake, J. E., Power, S. A., Duursma, R. A., Medlyn, B. E., Aspinwall, M. J., Choat, B., ... & Smith, R. A. (2017). Stomatal and non-stomatal limitations of photosynthesis for four tree species under drought: a comparison of model formulations. *Agricultural and Forest Meteorology*, *247*, 454-466.

Matheny, A. M., Mirfenderesgi, G., & Bohrer, G. (2017). Trait-based representation of hydrological functional properties of plants in weather and ecosystem models. *Plant diversity*, *39*(1), 1-12.

Section 3.2 of Naudts, K., Ryder, J., McGrath, M. J., Otto, J., Chen, Y., Valade, A., ... & Ghattas, J. (2015). A vertically discretised canopy description for ORCHIDEE (SVN r2290) and the modifications to the energy, water and carbon fluxes. *Geoscientific Model Development*, *8*, 2035-2065.

Bonan, G. B., Williams, M., Fisher, R. A., & Oleson, K. W. (2014). Modeling stomatal conductance in the earth system: linking leaf water-use efficiency and water transport along the soil–plant–atmosphere continuum. *Geoscientific Model Development*, *7*(5), 2193-2222.

Kennedy, D., Swenson, S., Oleson, K. W., Lawrence, D. M., Fisher, R., Lola da Costa, A. C., & Gentine, P. (2019). Implementing plant hydraulics in the community land model, version 5. *Journal of Advances in Modeling Earth Systems*, *11*(2), 485-513.

**Meghan Engh: Urban land cover change and urban processes in TEMs**

Best, M. J., & Grimmond, C. S. B. (2015). Key conclusions of the first international urban land surface model comparison project. *Bulletin of the American Meteorological Society*, *96*(5), 805-819. And references therein e.g. Oleson and Best papers.

Oleson, K. W., & Feddema, J. (2019). Parameterization and surface data improvements and new capabilities for the Community Land Model Urban (CLMU). *Journal of Advances in Modeling Earth Systems*.

Best, M. J., & Grimmond, C. S. B. (2016). Modeling the partitioning of turbulent fluxes at urban sites with varying vegetation cover. *Journal of Hydrometeorology*, *17*(10), 2537-2553.

References here: <https://www.theurbanist.com.au/2020/01/urban-plumber-at-ams-2020/> <https://www.theurbanist.com.au/2020/01/AMS20_Poster_200106s.pdf>

Lawrence, D. M., Hurtt, G. C., Arneth, A., Brovkin, V., Calvin, K. V., Jones, A. D., ... & Seneviratne, S. I. (2016). The Land Use Model Intercomparison Project (LUMIP) contribution to CMIP6: rationale and experimental design. *Geoscientific Model Development*, *9*, 2973-2998.

**Rubaya Pervin: Forest canopies (and radiative transfer)**

Chapters 14-16 of the textbook and references therein.

Relevant sections of Naudts, K., Ryder, J., McGrath, M. J., Otto, J., Chen, Y., Valade, A., ... & Ghattas, J. (2015). A vertically discretised canopy description for ORCHIDEE (SVN r2290) and the modifications to the energy, water and carbon fluxes. *Geoscientific Model Development*, *8*, 2035-2065.

Relevant sections of Fisher, R. A., Koven, C. D., Anderegg, W. R., Christoffersen, B. O., Dietze, M. C., Farrior, C. E., ... & Lichstein, J. W. (2018). Vegetation demographics in Earth System Models: A review of progress and priorities. *Global change biology*, *24*(1), 35-54.

Widlowski, J. L., Pinty, B., Clerici, M., Dai, Y., De Kauwe, M., De Ridder, K., ... & Olchev, A. (2011). RAMI4PILPS: An intercomparison of formulations for the partitioning of solar radiation in land surface models. *Journal of Geophysical Research: Biogeosciences*, *116*(G2).

**Ben Lockwood: woody growth and allocation**

Relevant sections of Chapters 17 and 19 of the textbook (see index)

De Kauwe, M. G., Medlyn, B. E., Zaehle, S., Walker, A. P., Dietze, M. C., Wang, Y. P., ... & Wårlind, D. (2014). Where does the carbon go? A model–data intercomparison of vegetation carbon allocation and turnover processes at two temperate forest free‐air CO2 enrichment sites. *New Phytologist*, *203*(3), 883-899. And references therein.

Also consider how biomass calculated at the stand level for each grid cell then gets allocated to different trees in models where they have 3d canopy structure: e.g. see Section 5.2 of of Naudts, K., Ryder, J., McGrath, M. J., Otto, J., Chen, Y., Valade, A., ... & Ghattas, J. (2015). A vertically discretised canopy description for ORCHIDEE (SVN r2290) and the modifications to the energy, water and carbon fluxes. *Geoscientific Model Development*, *8*, 2035-2065.

Montané, F., Fox, A. M., Arellano, A. F., MacBean, N., Alexander, M. R., Dye, A., ... & Pederson, N. (2017). Evaluating the effect of alternative carbon allocation schemes in a land surface model (CLM4. 5) on carbon fluxes, pools, and turnover in temperate forests. *Geoscientific Model Development (Online)*, *10*(9).

**Katie Biedler: current developments in modeling soil organic carbon/ SOM dynamics**

Chapter 18 of textbook and references therein

Wieder, W. R., Hartman, M. D., Sulman, B. N., Wang, Y. P., Koven, C. D., & Bonan, G. B. (2018). Carbon cycle confidence and uncertainty: Exploring variation among soil biogeochemical models. *Global change biology*, *24*(4), 1563-1579.

Wieder, W. R., Allison, S. D., Davidson, E. A., Georgiou, K., Hararuk, O., He, Y., ... & Todd‐Brown, K. (2015). Explicitly representing soil microbial processes in Earth system models. *Global Biogeochemical Cycles*, *29*(10), 1782-1800.

Wieder, W. R., Bonan, G. B., & Allison, S. D. (2013). Global soil carbon projections are improved by modelling microbial processes. *Nature Climate Change*, *3*(10), 909-912.

Todd-Brown, K. E., Randerson, J. T., Post, W. M., Hoffman, F. M., Tarnocai, C., Schuur, E. A., & Allison, S. D. (2013). Causes of variation in soil carbon simulations from CMIP5 Earth system models and comparison with observations. *Biogeosciences*, *10*(3), 1717-1736.

Todd-Brown, K. E., Zheng, B., & Crowther, T. W. (2018). Field-warmed soil carbon changes imply high 21st-century modeling uncertainty. *Biogeosciences*, *15*(12), 3659-3671.

Sulman, B. N., Moore, J. A., Abramoff, R., Averill, C., Kivlin, S., Georgiou, K., ... & Bradford, M. A. (2018). Multiple models and experiments underscore large uncertainty in soil carbon dynamics. *Biogeochemistry*, *141*(2), 109-123.

**G440**

**Landon New: Hillslope heterogeneity in TEM hydrology schemes**

Chapter 9 Section 9.3 of the textbook and references therein

Clark, M. P., Fan, Y., Lawrence, D. M., Adam, J. C., Bolster, D., Gochis, D. J., ... & Maxwell, R. M. (2015). Improving the representation of hydrologic processes in Earth System Models. *Water Resources Research*, *51*(8), 5929-5956. And references therein (see Table 3 for example for relevant processes).

Fan, Y., Clark, M., Lawrence, D. M., Swenson, S., Band, L. E., Brantley, S. L., ... & Kirchner, J. W. (2019). Hillslope hydrology in global change research and Earth system modeling. *Water Resources Research*, *55*(2), 1737-1772. And references therein.

Maxwell, R. M., & Kollet, S. J. (2008). Interdependence of groundwater dynamics and land-energy feedbacks under climate change. *Nature Geoscience*, *1*(10), 665-669. And references therein.

Swenson, S. C., Clark, M., Fan, Y., Lawrence, D. M., & Perket, J. (2019). Representing Intrahillslope Lateral Subsurface Flow in the Community Land Model. *Journal of Advances in Modeling Earth Systems*.

Gharari, S., Clark, M., Mizukami, N., Wong, J. S., Pietroniro, A., & Wheater, H. (2019). Improving the representation of subsurface water movement in land models. *Journal of Hydrometeorology*, (2019).

**Luke Fabina: Forest Management**

Naudts, K., Chen, Y., McGrath, M. J., Ryder, J., Valade, A., Otto, J., & Luyssaert, S. (2016). Europe’s forest management did not mitigate climate warming. *Science*, *351*(6273), 597-600

🡪 based on model developments in Naudts, K., Ryder, J., McGrath, M. J., Otto, J., Chen, Y., Valade, A., ... & Ghattas, J. (2015). A vertically discretised canopy description for ORCHIDEE (SVN r2290) and the modifications to the energy, water and carbon fluxes. *Geoscientific Model Development*, *8*, 2035-2065. (Also note commentary in response to Naudts et al. (2016) Science article).

References in Section 3.1.1, 3.1.2 and maybe 3.1.10 (if interested in fire management in forests) of Pongratz, J., Dolman, H., Don, A., Erb, K. H., Fuchs, R., Herold, M., ... & Naudts, K. (2018). Models meet data: Challenges and opportunities in implementing land management in Earth system models. *Global change biology*, *24*(4), 1470-1487. Other references may be found throughout this paper.

Sections relevant to forest harvesting in Erb, K. H., Luyssaert, S., Meyfroidt, P., Pongratz, J., Don, A., Kloster, S., ... & Haberl, H. (2017). Land management: data availability and process understanding for global change studies. *Global change biology*, *23*(2), 512-533.

Sections relevant to forest management in Erb, K. H., Kastner, T., Plutzar, C., Bais, A. L. S., Carvalhais, N., Fetzel, T., ... & Pongratz, J. (2018). Unexpectedly large impact of forest management and grazing on global vegetation biomass. *Nature*, *553*(7686), 73-76.

Sections relevant to wood harvest in Lawrence, D. M., Hurtt, G. C., Arneth, A., Brovkin, V., Calvin, K. V., Jones, A. D., ... & Seneviratne, S. I. (2016). The Land Use Model Intercomparison Project (LUMIP) contribution to CMIP6: rationale and experimental design. *Geoscientific Model Development*, *9*, 2973-2998.

**Craig Chandler: Land Cover Change in TEMs and LUMIP**

Prestele, R., Arneth, A., Bondeau, A., de Noblet-Ducoudré, N., Pugh, T. A., Sitch, S., ... & Verburg, P. H. (2017). Current challenges of implementing anthropogenic land-use and land-cover change in models contributing to climate change assessments.

Section 2.2 (especially 2.2.2) of Friedlingstein, P., Jones, M., O'Sullivan, M., Andrew, R., Hauck, J., Peters, G., ... & DBakker, O. (2019). Global carbon budget 2019. *Earth System Science Data*, *11*(4), 1783-1838.

Hurtt, G. C., Chini, L. P., Frolking, S., Betts, R. A., Feddema, J., Fischer, G., ... & Jones, C. D. (2011). Harmonization of land-use scenarios for the period 1500–2100: 600 years of global gridded annual land-use transitions, wood harvest, and resulting secondary lands. *Climatic change*, *109*(1-2), 117.

Lawrence, D. M., Hurtt, G. C., Arneth, A., Brovkin, V., Calvin, K. V., Jones, A. D., ... & Seneviratne, S. I. (2016). The Land Use Model Intercomparison Project (LUMIP) contribution to CMIP6: rationale and experimental design. *Geoscientific Model Development*, *9*, 2973-2998.

Arneth, A., Sitch, S., Pongratz, J., Stocker, B. D., Ciais, P., Poulter, B., ... & Gasser, T. (2017). Historical carbon dioxide emissions caused by land-use changes are possibly larger than assumed. *Nature Geoscience*, *10*(2), 79-84.

Li, W., Ciais, P., Yue, C., Gasser, T., Peng, S., & Bastos, A. (2018). Gross changes in forest area shape the future carbon balance of tropical forests. *Biogeosciences*, *15*(1), 91-103.

**Emma Winklejohn: Differences between crop models in TEMs**

Relevant sections of Pongratz, J., Dolman, H., Don, A., Erb, K. H., Fuchs, R., Herold, M., ... & Naudts, K. (2018). Models meet data: Challenges and opportunities in implementing land management in Earth system models. *Global change biology*, *24*(4), 1470-1487, e.g. current implementation in models

Sections relevant to the *ecosystem models (only)* in Müller, C., Elliott, J., Chryssanthacopoulos, J., Arneth, A., Balkovic, J., Ciais, P., ... & Iizumi, T. (2017). Global gridded crop model evaluation: benchmarking, skills, deficiencies and implications, Geosci. Model Dev., 10, 1403–1422

and

Müller, C., Elliott, J., Kelly, D., Arneth, A., Balkovic, J., Ciais, P., ... & Jones, C. D. (2019). The Global Gridded Crop Model Intercomparison phase 1 simulation dataset. *Scientific data*, *6*(1), 1-22 and references therein.

**Marie O’Neill: Alternative approaches to crop modeling not included in TEMs**

Relevant sections of Pongratz, J., Dolman, H., Don, A., Erb, K. H., Fuchs, R., Herold, M., ... & Naudts, K. (2018). Models meet data: Challenges and opportunities in implementing land management in Earth system models. *Global change biology*, *24*(4), 1470-1487, e.g. future/planned implementation in models.

Relevant sections of Erb, K. H., Luyssaert, S., Meyfroidt, P., Pongratz, J., Don, A., Kloster, S., ... & Haberl, H. (2017). Land management: data availability and process understanding for global change studies. *Global change biology*, *23*(2), 512-533.

Sections relevant to the *site-based process models (only)* in Müller, C., Elliott, J., Chryssanthacopoulos, J., Arneth, A., Balkovic, J., Ciais, P., ... & Iizumi, T. (2017). Global gridded crop model evaluation: benchmarking, skills, deficiencies and implications, Geosci. Model Dev., 10, 1403–1422

and

Müller, C., Elliott, J., Kelly, D., Arneth, A., Balkovic, J., Ciais, P., ... & Jones, C. D. (2019). The Global Gridded Crop Model Intercomparison phase 1 simulation dataset. *Scientific data*, *6*(1), 1-22 and references therein.

**John Dietrich: Fire in TEMs**

Rabin, S. S., Melton, J. R., Lasslop, G., Bachelet, D., Forrest, M., Hantson, S., ... & Hickler, T. (2017). The fire modeling intercomparison project (FireMIP), phase 1: experimental and analytical protocols. *Geoscientific Model Development*, *20*, 1175-1197. And references therein – in particular references of different models in Table 2.

Hantson, S., Arneth, A., Harrison, S. P., Kelley, D. I., Prentice, I. C., Rabin, S. S., ... & Bachelet, D. (2016). The status and challenge of global fire modelling. *Biogeosciences*, *13*(11), 3359-3375. And review all references therein.

Also search for “fire” in Fisher, R. A., Koven, C. D., Anderegg, W. R., Christoffersen, B. O., Dietze, M. C., Farrior, C. E., ... & Lichstein, J. W. (2018). Vegetation demographics in Earth System Models: A review of progress and priorities. *Global change biology*, *24*(1), 35-54.

Review of if/how fire is implemented as a management tool in Pongratz, J., Dolman, H., Don, A., Erb, K. H., Fuchs, R., Herold, M., ... & Naudts, K. (2018). Models meet data: Challenges and opportunities in implementing land management in Earth system models. *Global change biology*, *24*(4), 1470-1487. Other references may be found throughout this paper.

**Jesse Sasser: Human intervention of hydrological cycle/management of water resources**

Section 3.3 of Clark, M. P., Fan, Y., Lawrence, D. M., Adam, J. C., Bolster, D., Gochis, D. J., ... & Maxwell, R. M. (2015). Improving the representation of hydrologic processes in Earth System Models. *Water Resources Research*, *51*(8), 5929-5956. And references therein (see Table 3 for example for relevant processes) and references within that section.

Pokhrel, Y. N., Hanasaki, N., Wada, Y., & Kim, H. (2016). Recent progresses in incorporating human land–water management into global land surface models toward their integration into Earth system models. *Wiley Interdisciplinary Reviews: Water*, *3*(4), 548-574.

Nazemi, A., & Wheater, H. S. (2015). On inclusion of water resource management in Earth system models–Part 1: Problem definition and representation of water demand. *Hydrology and Earth System Sciences*, *19*(1), 33-61. And references therein.

Nazemi, A., & Wheater, H. S. (2015). On inclusion of water resource management in Earth system models--Part 2: Representation of water supply and allocation and opportunities for improved modeling. *Hydrology & Earth System Sciences*, *19*(1). And references therein.

You may also look at wetland drainage issues in both Pongratz, J., Dolman, H., Don, A., Erb, K. H., Fuchs, R., Herold, M., ... & Naudts, K. (2018). Models meet data: Challenges and opportunities in implementing land management in Earth system models. *Global change biology*, *24*(4), 1470-1487 and Erb, K. H., Luyssaert, S., Meyfroidt, P., Pongratz, J., Don, A., Kloster, S., ... & Haberl, H. (2017). Land management: data availability and process understanding for global change studies. *Global change biology*, *23*(2), 512-533.

In terms of highlighting impacts of climate change on water resources see:

Clark, M. P., Wilby, R. L., Gutmann, E. D., Vano, J. A., Gangopadhyay, S., Wood, A. W., ... & Brekke, L. D. (2016). Characterizing uncertainty of the hydrologic impacts of climate change. *Current Climate Change Reports*, *2*(2), 55-64.

And

Chapters 3-5 of the IPCC AR5 Working Group II report on impacts on terrestrial water resources: <https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf>