and that dynamic of epidemics is the result of complex combinations of microclimatic variables acting at different times (times and durations). Our goal is to build three models: appearance of infections, first produced spores, intensification of sporulation. For this purpose, a trial was set up in Costa Rica in three sites at different altitudes and under different oceanic influences in order to cover important fluctuations of the mesoclimate. The microclimate is measured continuously using weather stations and a weekly monitoring of rust lesions is performed to know the dates of onset of the different symptoms corresponding to different stages of development of the epidemic. Preliminary results on the microclimate variables (nature and timing) that determine the onset of first symptom (emergence of non-sporulating lesions) will be presented and discussed.

***Title*: Crop diseases and pests: from crop losses to biocomplexity**

Presenter: Kersebaum, Kurt Christian

Author: S. Savary, INRA France, P. D. Esker PennState, USA, N. McRoberts UCDavis, USA, L. Willocquet, INRA France, K. C. Kersebaum, ZALF Germany, S. Asseng U. Florida, USA, W. Pavan, U. Passo Fundo, Brazil, R. Ferrise, U. of Florence, Italy, R. Magarey, North Carolina State U. USA, M. Donatelli, CREA Italy, S. Bregaglio, CREA Italy.

Abstract: PeDiMIP, the pest and disease modeling intercomparison project, participated in the International Conference on Global Crop Losses organized in Paris in October 2017, where participants from some 20 countries addressed the effects and modeling of crop losses. Progress is also underway at several centers in Europe and the USA in the intercomparison of several Wheat crop models augmented with dynamic damage mechanisms for an array of diseases, insects and weeds. Diseases and pests are integral part of world's crop systems, and are critical elements to understand, model, and manage sustainable farming systems. These systems – their design, development, management, and their disruption or sustainability – involve human beings – farmers, policymakers, consumers – to a very high degree. A next frontier in the modeling of crop diseases and pests therefore involves addressing the biocomplexity of human-managed systems. While the Wheat - Multiple Pest system exemplifies biocomplexity in annual crops, the Coffee-Rust system is an excellent and key example of biocomplexity in perennials. Simulation outputs illustrate the annual oscillations of coffee yields, the negative effect of rust intensity on yield, and the positive feed-back of attainable yield on rust intensity. Simulation modeling enables understanding why rust exacerbates variation in coffee yield, how fungicides may reduce losses, and why shade trees dampen dangerous annual oscillations in yield and disease, while enhancing ecosystem services. Modeling biocomplexity in [human - crop - diseases and pests] systems is a critical challenge for sustainable farming systems modeling, as well as for the development of next generation models and tools.

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Session 2B: Advanced Computational Applications for Agriculture

***Title*: The Agricultural Model Exchange Initiative**

Presenter: Pierre Martre

Author: Martre Pierre[1], Donatelli Marcello[2], Pradal Christophe[3], Enders Andreas[4], Ahmed Midingoyi Cyrille[1], Athanasiadis Ioannis[5], Fumagalli Davide[6], Holzworth Dean[7], Hoogenboom Gerrit[8], Porter Cheryl[9], Raynal Hélène[10], Rizzoli Andrea[11], Thorburn Peter[12]

[1] LEPSE, Université Montpellier, INRA, Montpellier SupAgro, Montpellier, France

[2] Research Center for Agriculture and Environment, Council for Agricultural Research and Economics (CREA), Bologna, Italy

[3] AGAP, Université Montpellier, CIRAD, INRA, Montpellier SupAgro, Montpellier, France

[4] Institute of Crop Science and Resource Conservation (INRES), University of Bonn, Bonn, Germany

[5] Alterra, Wageningen UR, Wageningen, The Netherlands

[6] Institute for Environment and Sustainability, Joint Research Centre, European Commission, Ispra, Italy

[7] CSIRO Agriculture and Food, Toowoomba, Australia

[8] Institute for Sustainable Food Systems, University of Florida, Gainesville, USA

[9] Agricultural & Biological Engineering, University of Florida, Gainesville,

Abstract: Process-based crop simulation models are increasingly popular tools to analysis and predict the response of agricultural systems to climatic, agronomic and, more recently genetic, factors. The diversity of models in use illustrates the success of crop modeling. For instance, in it is current work the AgMIP Wheat team uses 42 different wheat models. Several groups in AgMIP have reported large uncertainty in climate impact studies, which is calling for more systematic model intercomparisons and improvements at the process level. However, the limited possibilities of model components (algorithms) and code exchange between platforms/models hinders such work. Collaborative efforts between crop physiologists, crop modelers, and software engineers are urgently needed to ease the integration in crop models of new knowledge in plant and soil sciences. To this end, several leading groups in the field have recently liaised to form the Agricultural Model Exchange Initiative (AMEI). AMEI is an open initiative that aims to address different challenges for exchanging model units at different granularities (from individual processes to whole plant) between modeling frameworks by (1) defining standards to describe model units and composition exchange format based on a declarative representation; (2) including unit tests with invariants and shared standard parametrizations; and (3) developing a web-platform to publish, document, and exchange the model units. We will provide a conceptual and technical overview of the state of the work and give practical examples of successful component exchange between different frameworks.

***Title*:** **Making messy socio-economic data FAIR**

Presenter: Gideon Kruseman

Author: Kruseman, Gideon[1], Kim, Soonho[2], Van Wijk, Mark[3]

[1] International Maize and Wheat Improvement Center (CIMMYT)

[2] International Food Policy Research Institute (IFPRI)

[3] International Livestock research Institute (ILRI)