Ahmed Tawfik
National Center for Atmospheric Research
Climate and Global Dynamics

Less Dry Entrainment
Shallower PBL
More Evapotranspiration

Restrained mixed layer drying

More Dry Entrainment
Deeper PBL
More Sensible Heating

Accelerated Demand
Greater mixed layer drying

Moisture Source into PBL
Weak Moisture Source into PBL

Wet Soil
More Evapotranspiration
Less Dry Entrainment

Restrained mixed layer drying

Dry Soil
More Sensible Heating
More Dry Entrainment

Restrained mixed layer drying
Knowledge Gaps

Which water-related limitation(s) in process-understanding, modeling, and monitoring in the Western U.S. and Canada require a large, 5-10 year integrated and interdisciplinary team approach?

Goals and Roadmap

What do you see as the key objectives and tasks?

Justification

Which resultant social, economic, and/or environmental benefits justify the associated capital investment?
What do you see as the key objectives and tasks?

Knowledge Gaps
Which water-related limitation(s) in process-understanding, modeling, and monitoring in the Western U.S. and Canada require a large, 5-10 year integrated and interdisciplinary team approach?

Justification
Which resultant social, economic, and/or environmental benefits justify the associated capital investment?

Goals and Roadmap
What do you see as the key objectives and tasks?
Atmospheric

Social,
Economic,
Environmental

Surface Processes
Atmospheric

Social, Economic, Environmental

Surface Processes

Food Security?
Crop Yields?
Shift to Pasture?

Social, Economic, Environmental

Feasibility of Irrigation?
Forest Plantations?
Atmospheric
Social, Economic, Environmental
Surface Processes

Regional Temporal Assumptions

Food Security?
Crop Yields?
Shift to Pasture?

Social, Economic, Environmental
Feasibility of Irrigation?
Forest Plantations?
Atmospheric, Social, Economic, Environmental Surface Processes

Regional Temporal Assumptions

Food Security?
Crop Yields?
Shift to Pasture?
Social, Economic, Environmental
Feasibility of Irrigation?
Forest Plantations?
Atmospheric

Social, Economic, Environmental

Surface Processes

L-A Feedbacks enforcing biases

Modeling soil water retention

Nocturnal Convection (MCS development)

Regional Temporal Assumptions

Food Security?

Crop Yields?

Shift to Pasture?

Social, Economic, Environmental

Feasibility of Irrigation?

Forest Plantations?

Great Plains Seasonal or IAV?
Atmospheric

Social, Economic, Environmental

Surface Processes

Atmospheric Rivers

L-A Feedbacks enforcing biases

Regional

Temporal

Assumptions

Food Security?

Crop Yields?

Shift to Pasture?

Social, Economic, Environmental

Feasibility of Irrigation?

Forest Plantations?
Atmospheric

Social, Economic, Environmental

Surface Processes

Regional Temporal Assumptions

Food Security?
Crop Yields?
Shift to Pasture?
Social, Economic, Environmental
Feasibility of Irrigation?
Forest Plantations?
Drought Year versus Wet Year

Drought: 2006

More likely to trigger convection

Wet: 2007

Less likely to trigger convection
California Drought

Convective Threshold Anomalies [K]

1980  1990  2000  2010
Climate: Interannual Variability of CI Events

(Tawfik et al. 2015 Part 2 JHM)
Mechanism: Land Cover Comparison 2002

Pine Forest

Grassland