

# Using GIS to Examine the Spatial-Temporal Dynamics of Soil Moisture-Precipitation Interactions

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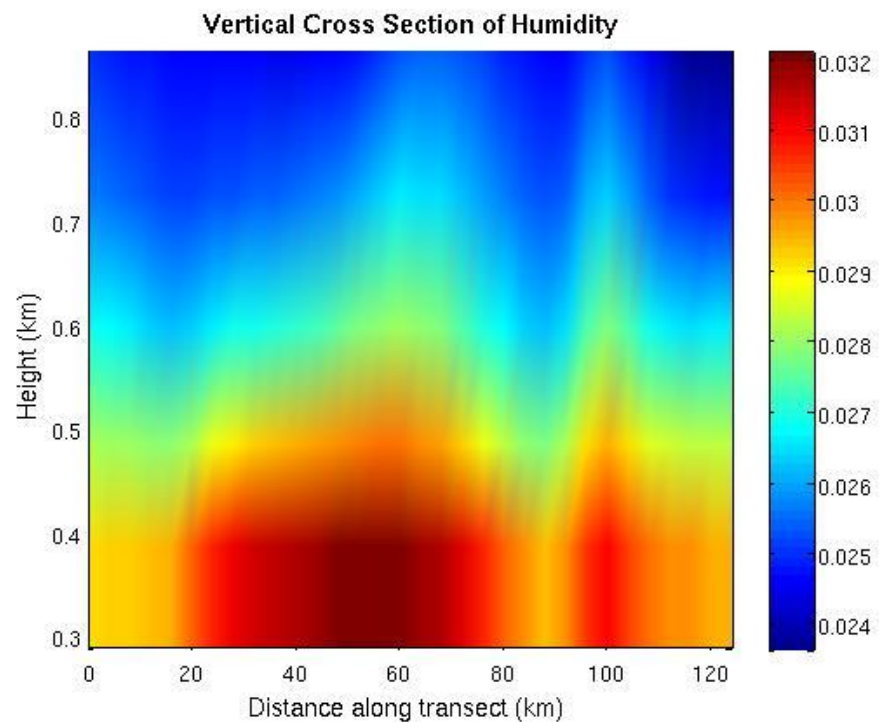
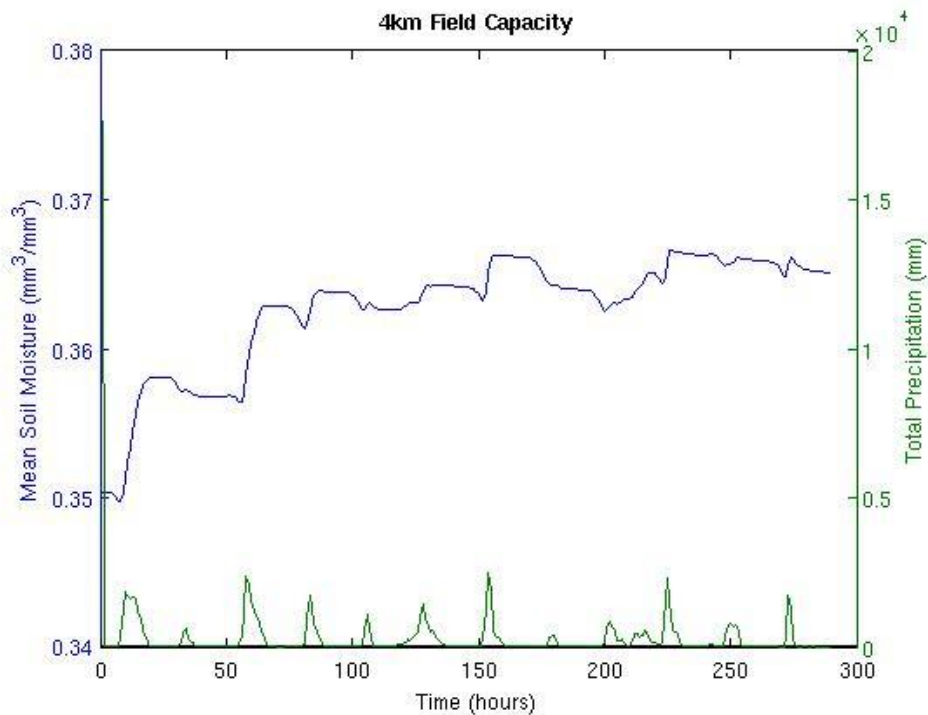
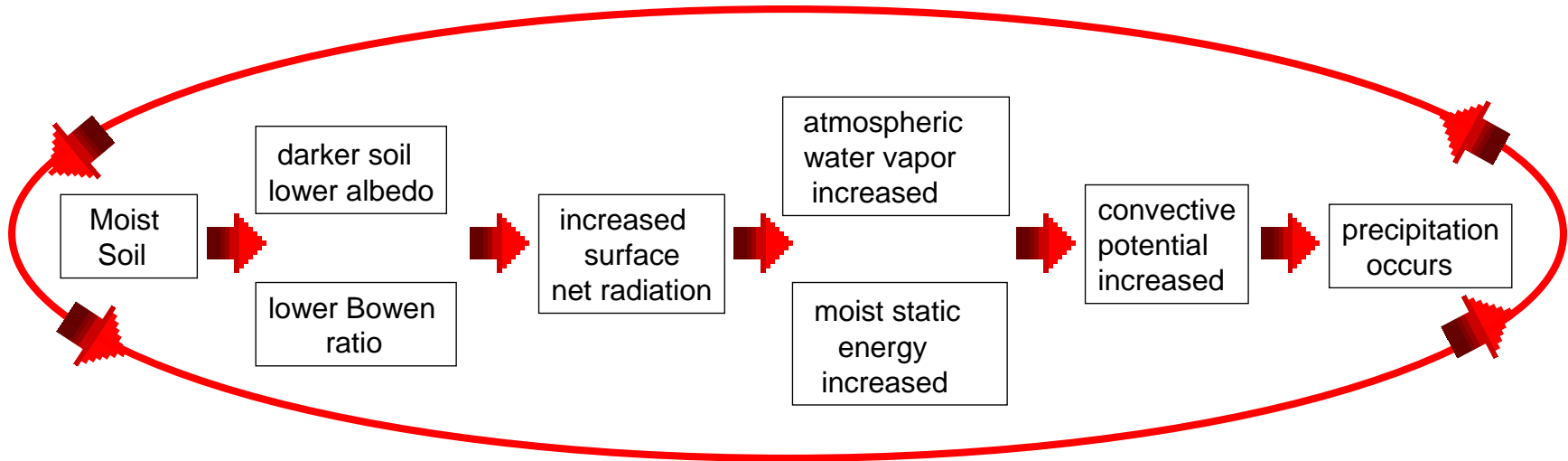
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# Research Questions

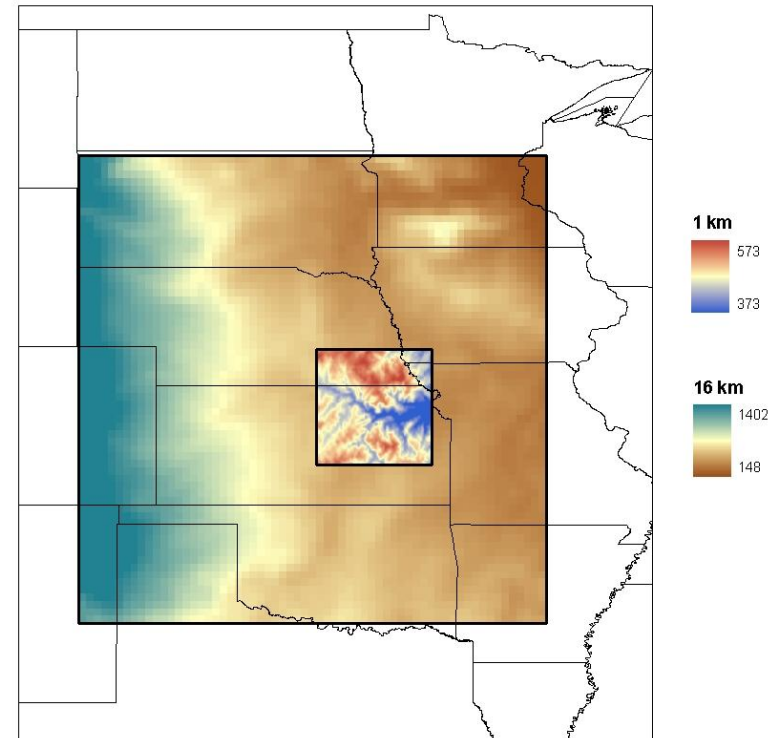
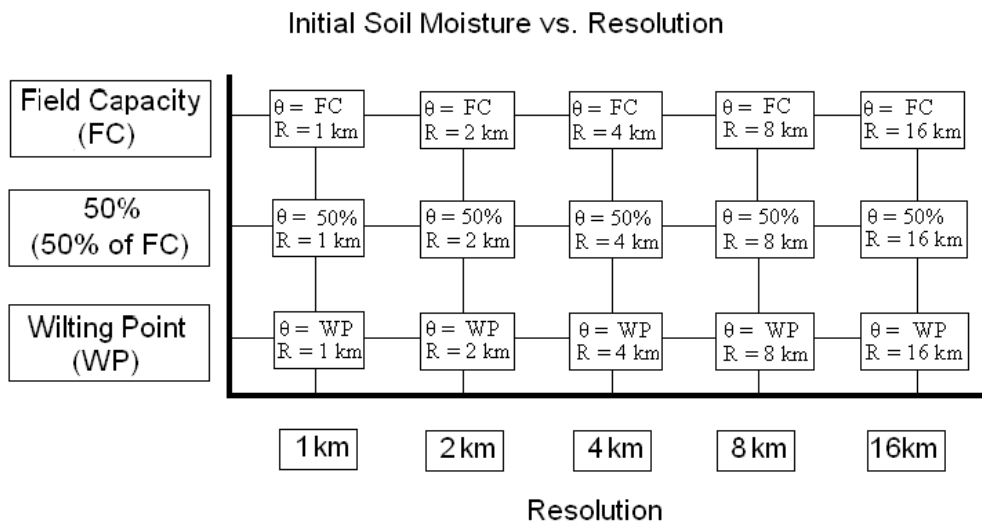
Geographic Information Systems provide a framework in which to quantify the spatial-temporal interactions between the surface and the atmosphere.

- How does altering the amount of spatial heterogeneity and mean soil moisture modify the precipitation patterns in a region through feedbacks between the land surface and atmosphere?
- How does the magnitude of feedback between soil moisture and precipitation vary in both space and time?

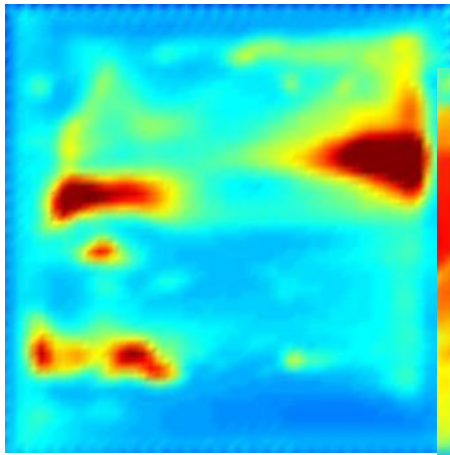


- University of Oklahoma's Advanced Regional Prediction System (ARPS) mesoscale model
- A suite of 15 model runs with varying initial soil moisture and resolution focused on the Konza Prairie
- Using the model output, we examine the spatial and temporal dynamics of the coupling between soil moisture and precipitation

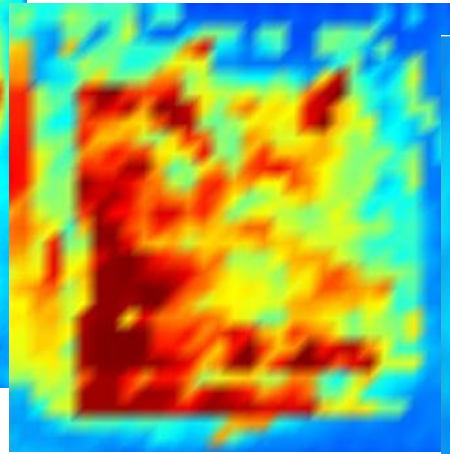
Initial Soil Moisture  $\theta$



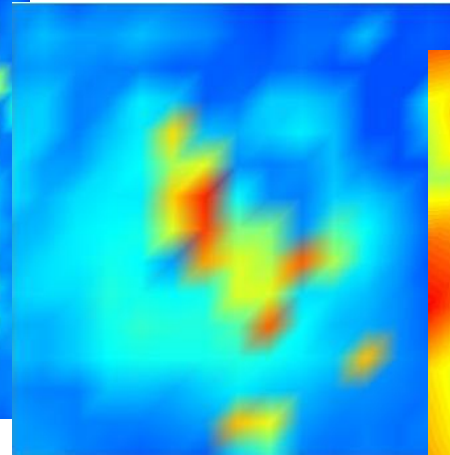
# Soil Moisture



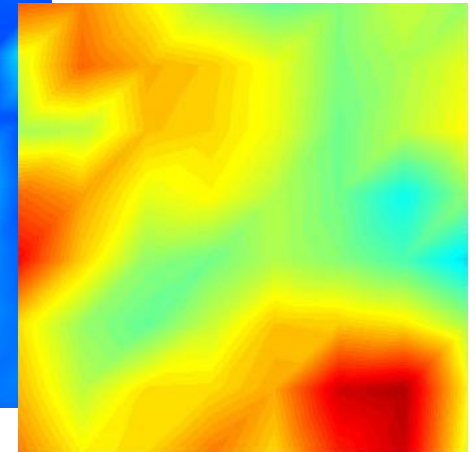
2 km



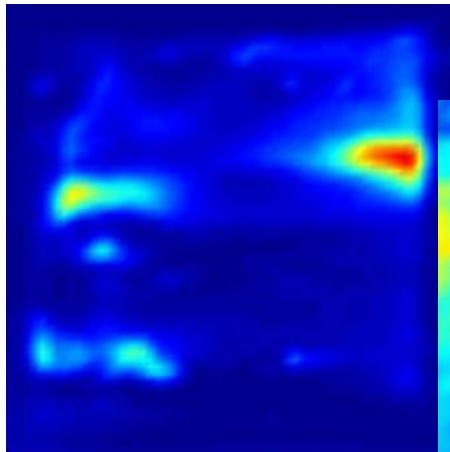
4 km



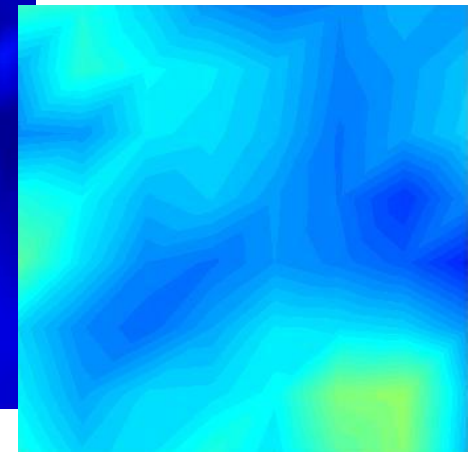
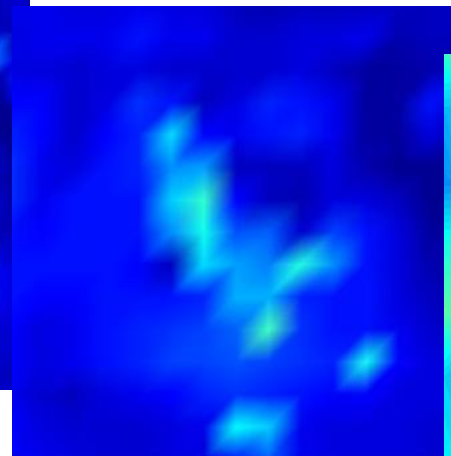
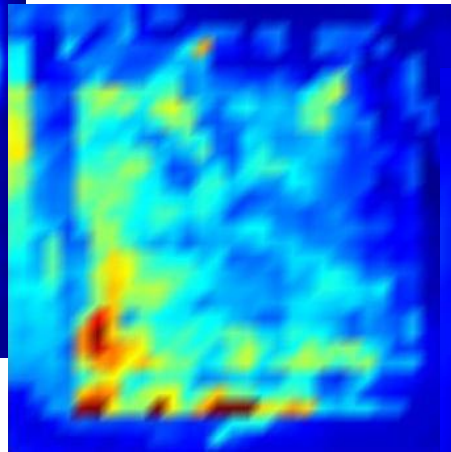
8 km



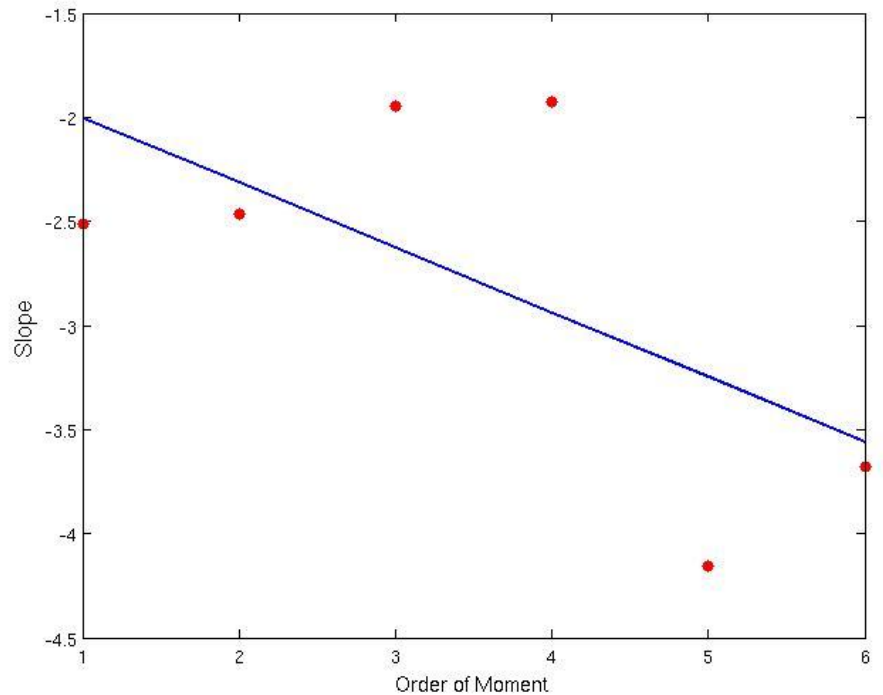
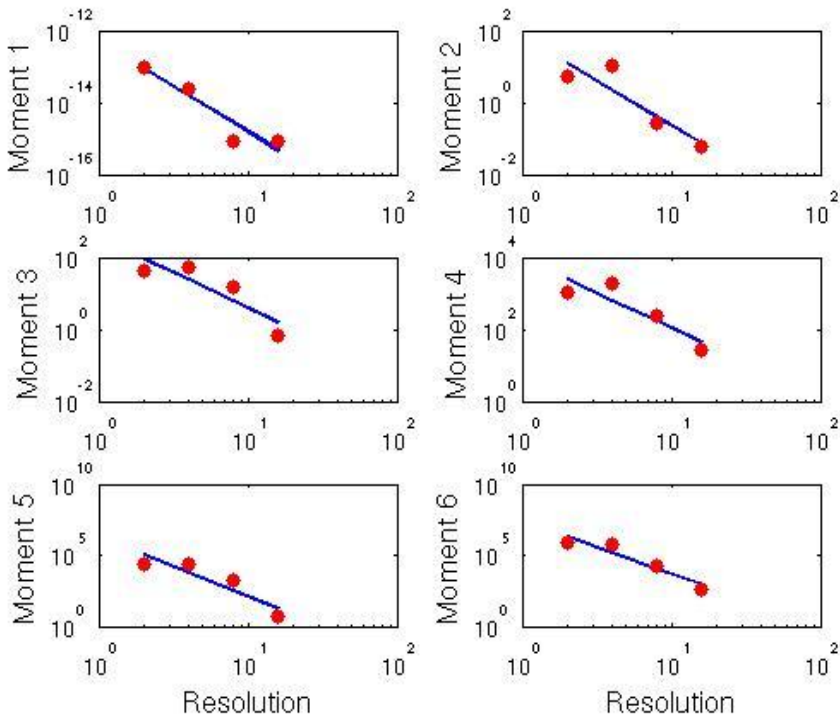
16 km



Precipitation

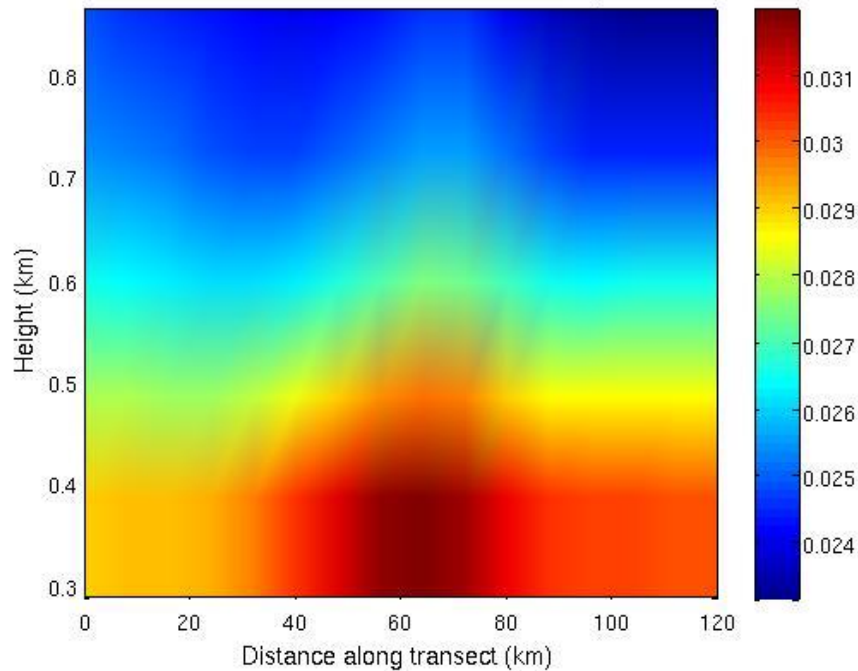


# Scaling Analysis

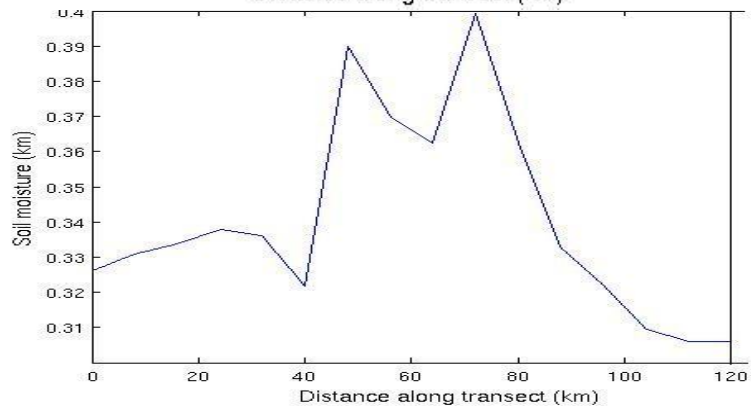


# Spatial-Temporal Interactions

Vertical Cross Section of Humidity

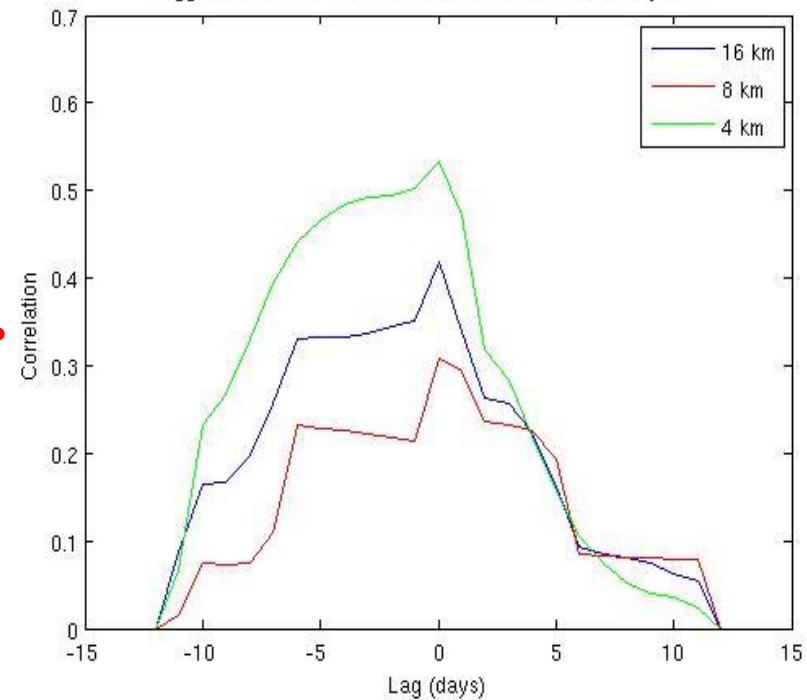


Distance along transect (km)



Distance along transect (km)

Lagged Correlation between Soil Moisture and Precipitation





# Summary

- We can use a GIS framework to investigate the relationships between soil moisture and precipitation.
- Altering the amount of spatial heterogeneity and mean soil moisture, such as through irrigation, can potentially alter the precipitation patterns in a region.
- Understanding these relationships has important implications for predictability of crop yields and water availability for agricultural and urban uses.