



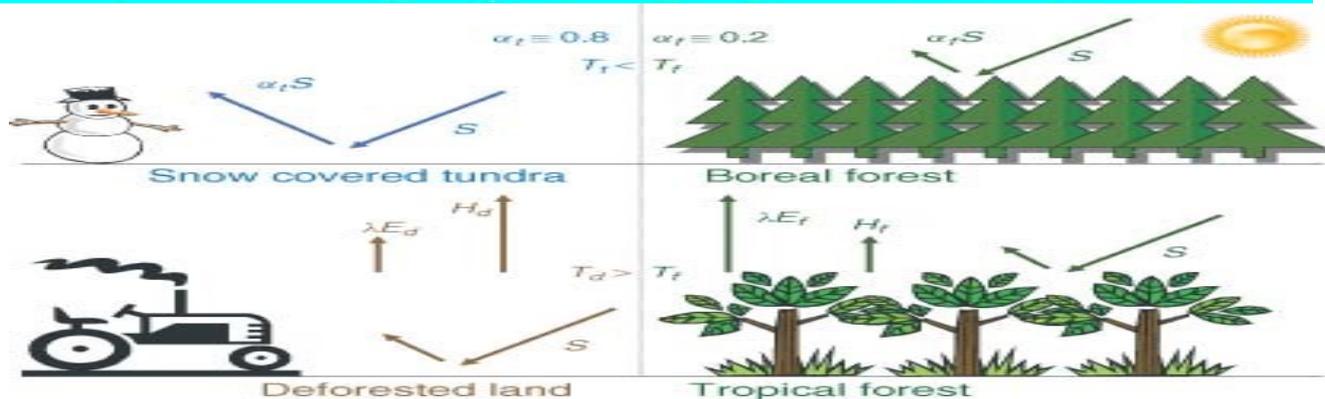
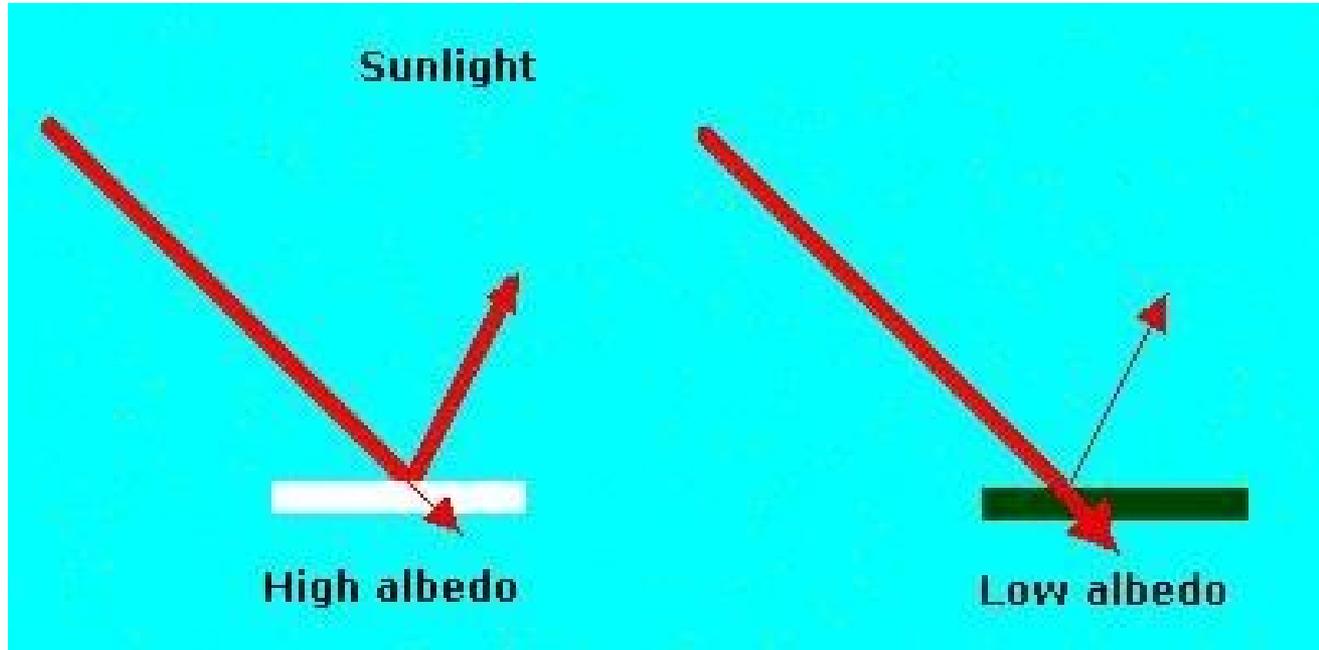
# Impacts of agriculture on climate

## Hugo Berbery

University of Maryland



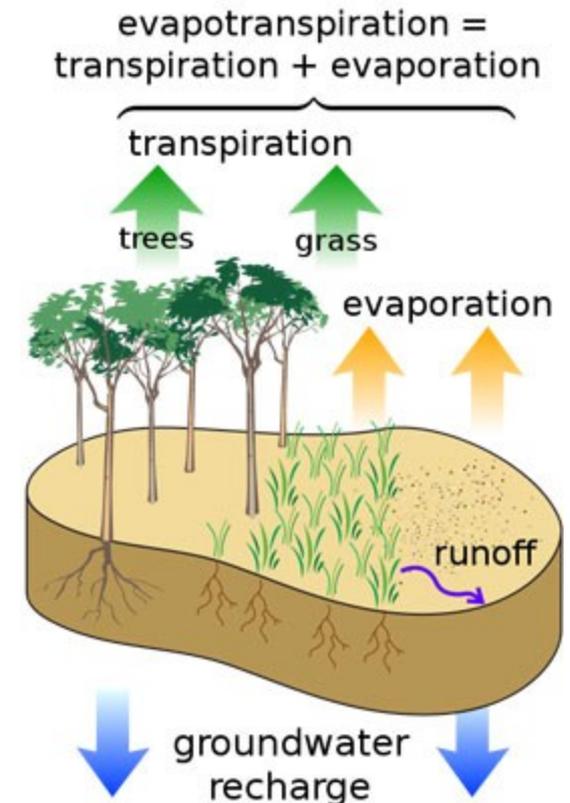
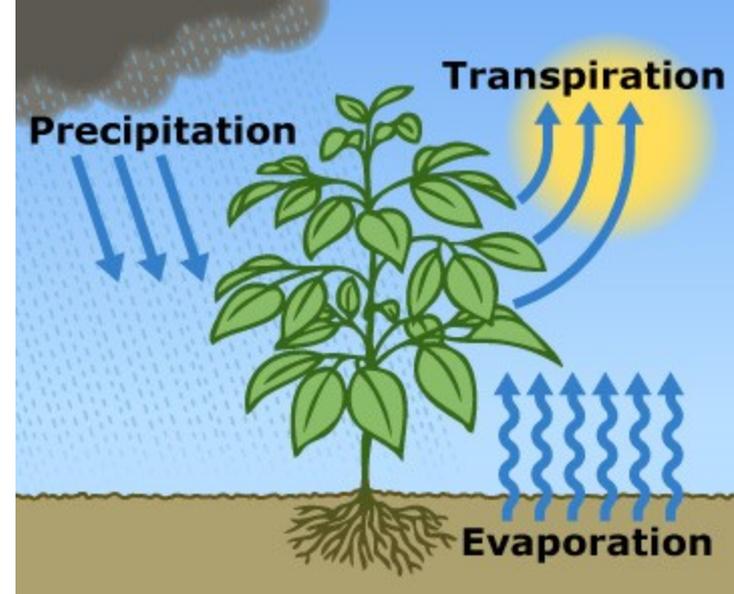
# Efecto de la superficie en la radiación del sol (albedo)



La tasa de **evapotranspiración (EVT)** depende de factores climáticos, como temperatura, luz solar, viento y humedad.

EVT también depende de la **especie de planta**, porque las especies dependen de su habilidad de regular agua y adaptarse al **stress inducido por la falta de agua**.

El **grado de cobertura vegetal**, así como la **profundidad de las raíces** son elementos importantes también.



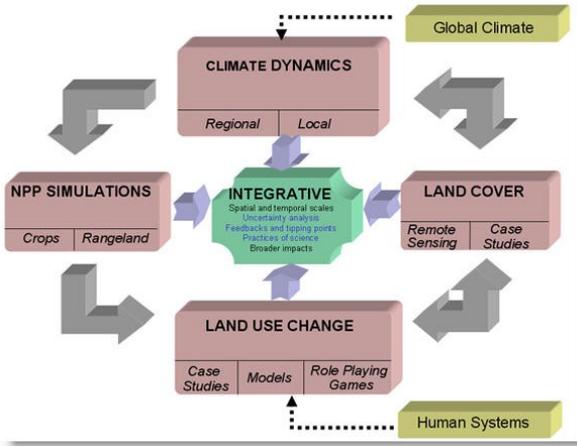
# La rugosidad de suelo afecta a los vientos en capas bajas



**Como son la rugosidad, el albedo y la evapotranspiracion en cada parcela?**

**Como se pueden resolver todos estos efectos en forma conjunta, y sus impactos en el clima regional?**

# Los ingredientes de un modelo regional



$$\frac{dU}{dt} = fV - K \frac{\partial S}{\partial X} - RT \left( \frac{\partial q}{\partial X} + \frac{G_1}{G_0} \frac{\partial q}{\partial Z} \right) + F_x \quad (15)$$

$$\frac{dV}{dt} = -fU - K \frac{\partial S}{\partial Y} - RT \left( \frac{\partial q}{\partial Y} + \frac{G_2}{G_0} \frac{\partial q}{\partial Z} \right) + F_y \quad (16)$$

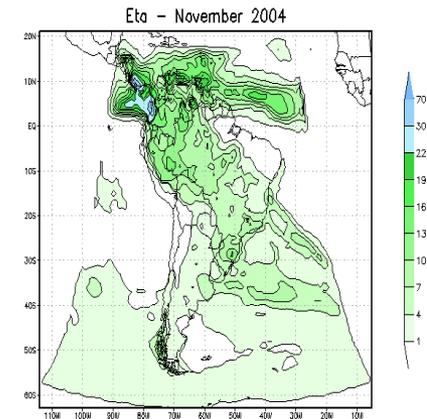
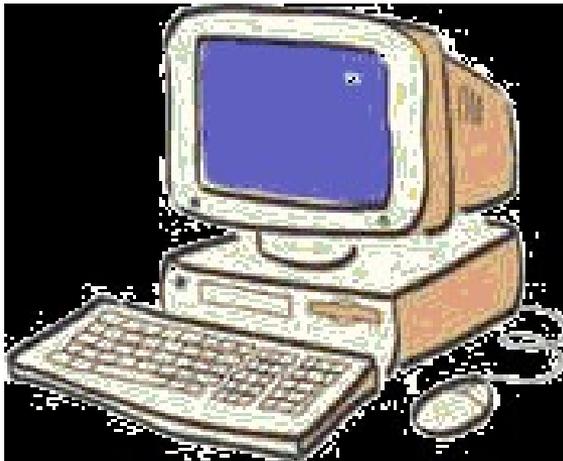
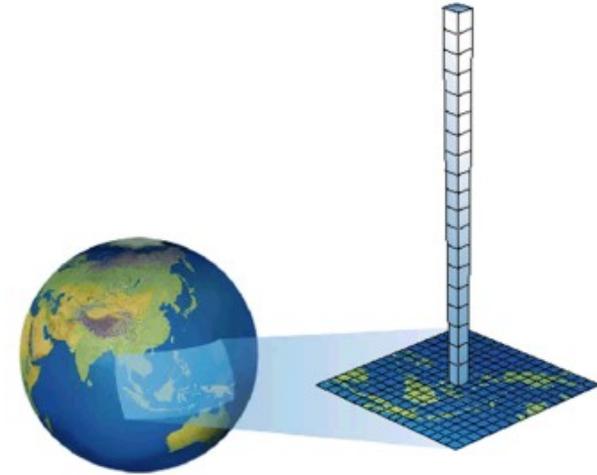
$$\frac{dw}{dt} = -g - \frac{RT}{G_0} \frac{\partial q}{\partial Z} + F_z \quad (17)$$

$$(1 - \kappa) \frac{dq}{dt} = S(F_1U + F_2V) - S \left( \frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} \right) - \frac{1}{G_0} \left( \frac{\partial G_0 W}{\partial Z} \right) + \frac{L}{T} \quad (18)$$

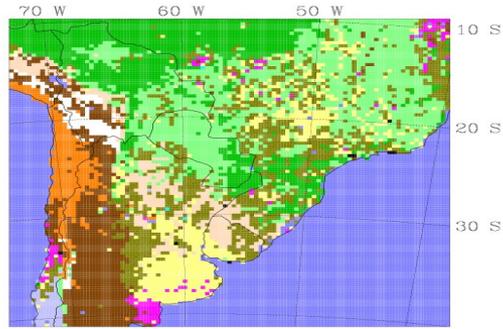
$$\frac{dT}{dt} = \kappa T \frac{dq}{dt} + L \quad (19)$$

$$\frac{dM}{dt} = E \quad (20)$$

$$W = \frac{S(G_1U + G_2V) + w}{G_0}, \quad (21)$$

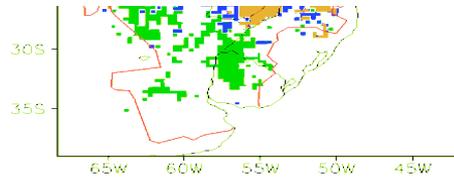


# Un ejercicio: Supongamos que toda la Cuenca del Plata estuviera cubierta por cultivos

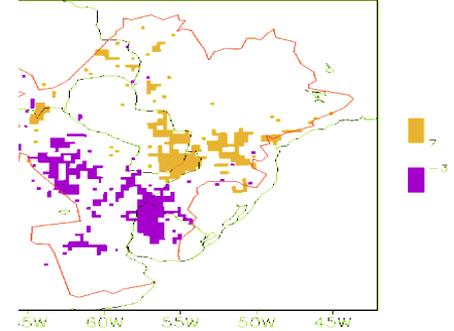


**Land Use Category**

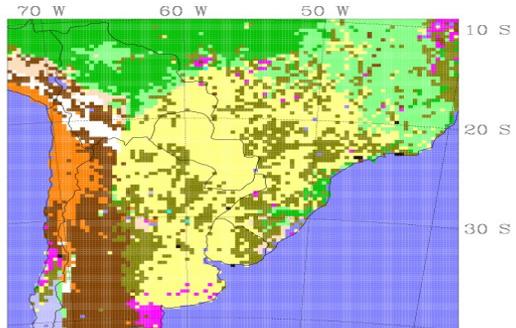
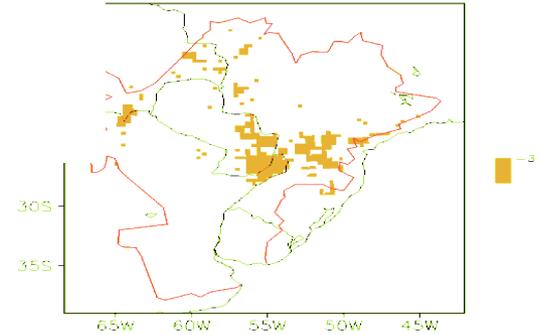
1 Urban and Built-Up Land	13 Evergreen Broadleaf Forest
2 Dryland Cropland and Pasture	14 Evergreen Needleleaf Forest
3 Irrigated Cropland and Pasture	15 Mixed Forest
4 Mixture of 2 and 3	16 Water Bodies
5 Cropland/Grassland Mosaic	17 Herbaceous Wetland
6 Cropland/Woodland Mosaic	18 Wooded Wetland
7 Grassland	19 Barren or Sparsely Vegetated
8 Shrubland	20 Herbaceous Tundra
9 Mixture of 7 and 8	21 Wooded Tundra
10 Savanna	22 Mixed Tundra
11 Deciduous Broadleaf Forest	23 Bare Ground Tundra
12 Deciduous Needleleaf Forest	24 Snow or Ice



(b) ALBEDO CHANGE

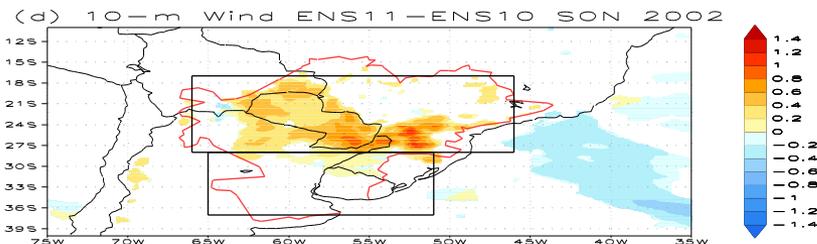
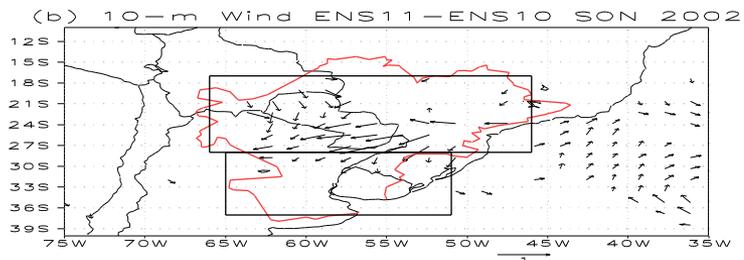
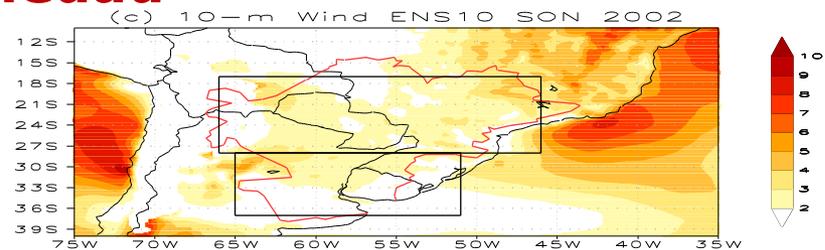
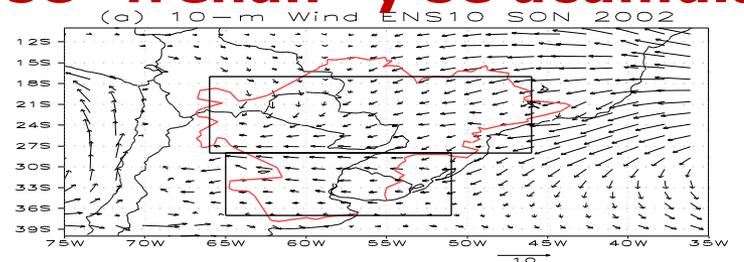


(d) EMISSIVITY CHANGE



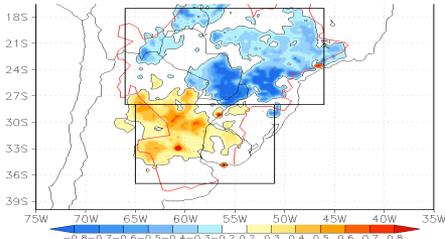
**Como era de esperar, los vientos en niveles bajos son afectados por la reduccion de la rugosidad:**

**En la zona norte de la cuenca, los vientos se aceleran y sacan humedad de la region. En la zona sur, los vientos se "frenan" y se acumula humedad**

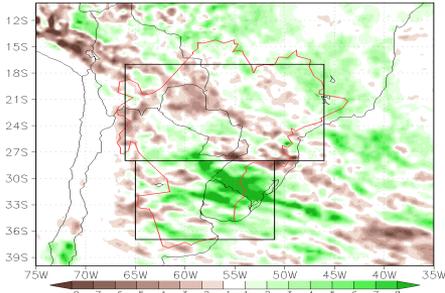


# Model land cover and its modification

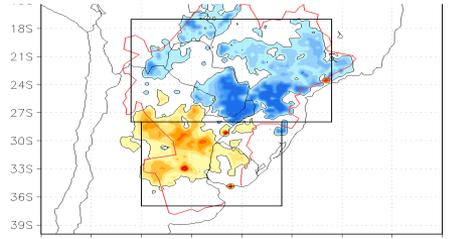
## Two-meter temperature differences between CROP and NATR experiments



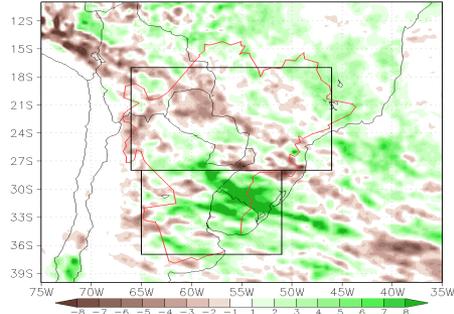
(b) PRCP CROP-NATR SON 2002



## Precipitation differences between CROP and NATR experiments



(b) PRCP CROP-NATR SON 2002



Hemos presentado evidencia de que la agricultura puede cambiar al clima de una region.

Pero recuerden que estas son simulaciones idealizadas.

**Agyuje**

**Gracias!**

