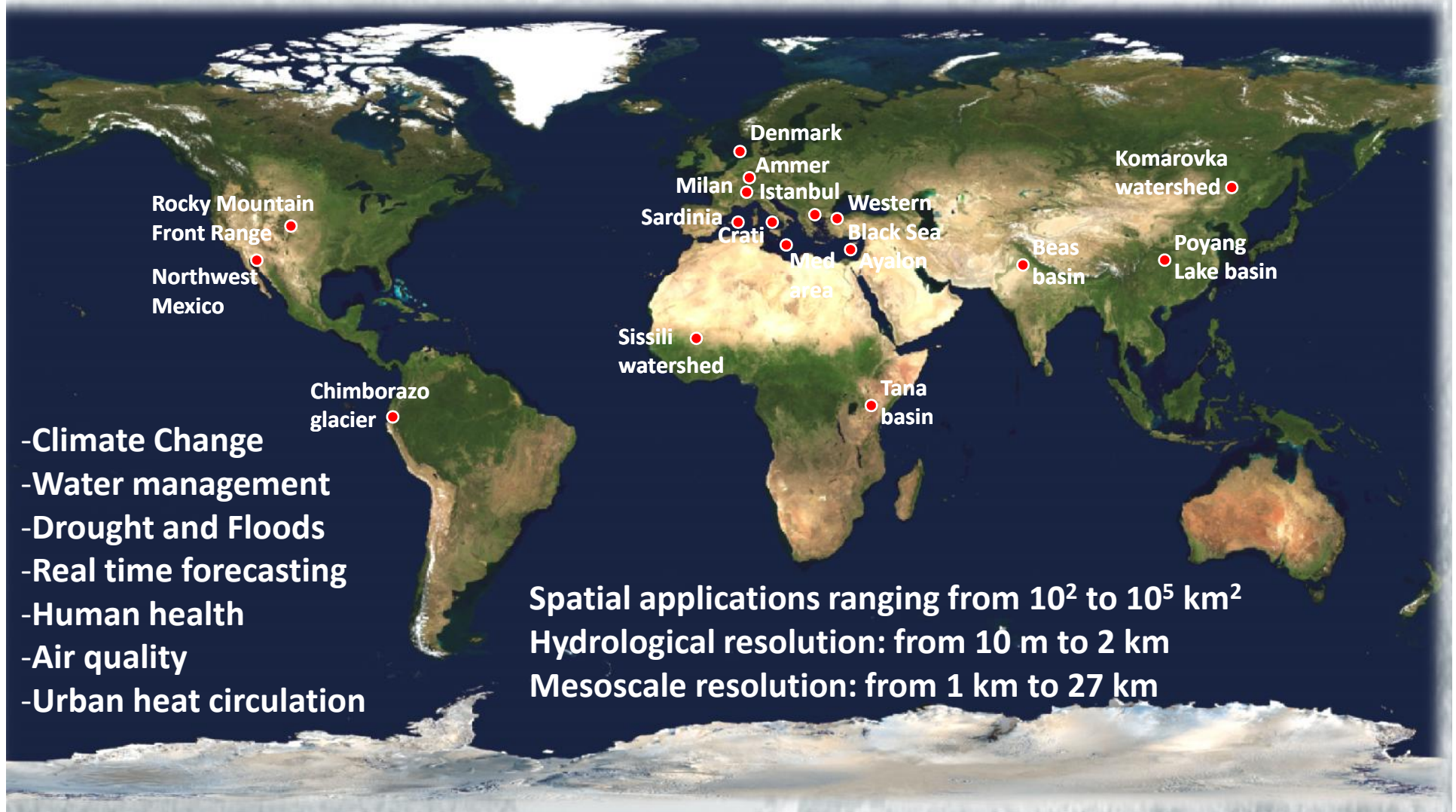


1st European Fully Coupled Atmospheric-Hydrological Modeling and WRF-Hydro Users workshop

University Club Hall at University of Calabria
Rende (Cosenza, Italy), June 11-13, 2014



1st European Fully Coupled Atmospheric-Hydrological Modeling and WRF-Hydro Users workshop



UNIVERSITÀ DELLA CALABRIA



Dipartimento di Ingegneria per l'Ambiente e il Territorio e Ingegneria Chimica



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PHENOMENON

POINTS
OF
VIEW

COMMON
FRAMEWORK

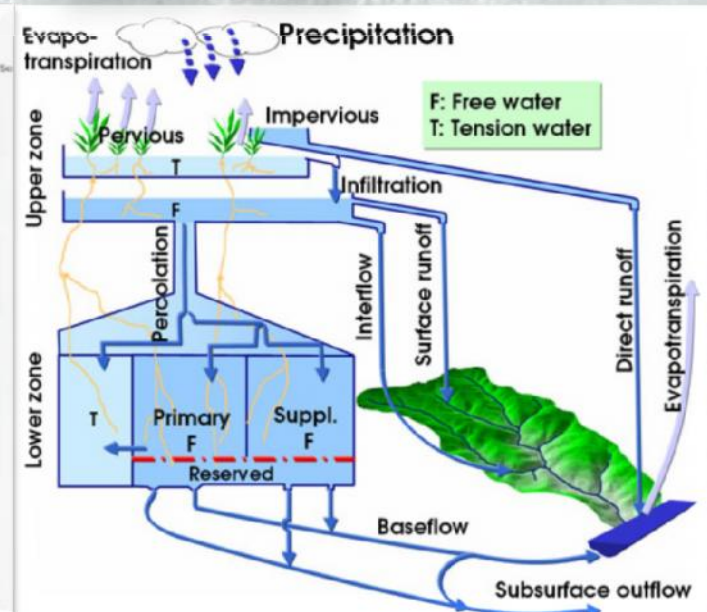
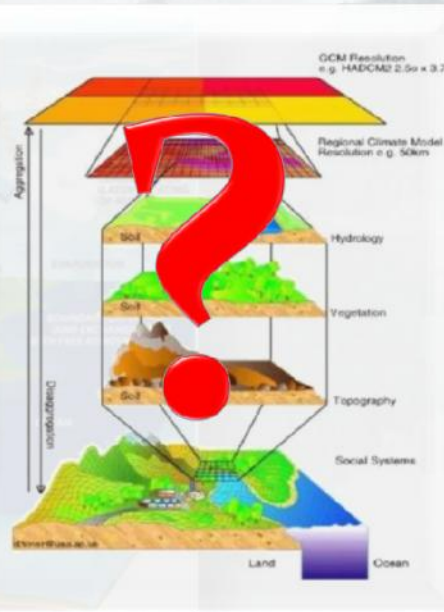
University Club Hall at University of Calabria
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WATER CYCLE

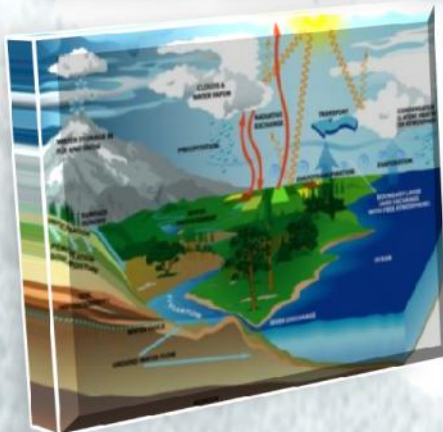
METEOROLOGISTS:
 Global scale

HYDROLOGISTS:
 Basin scale

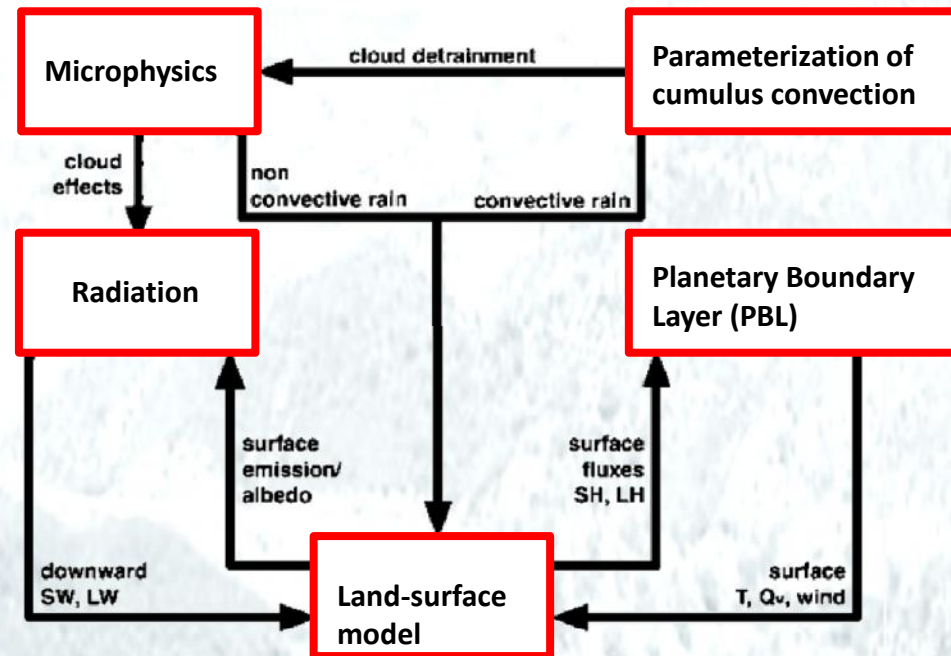


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Global water cycle



Numerical Weather Prediction (NWP) Model



Boundary and initial conditions are essential for accurate predictions

- NWP models are an essential element for forecasting all disasters related to the hydrological cycle
- Forecasting is carried out using mathematical equations describing the physics and dynamics of the atmosphere (these models, the opposite of hydrological models, do not generally require a specification calibration).

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Numerical Weather Prediction (NWP) Model

Global water cycle



These models typically predict temperature with reasonable confidence, predictions of precipitation are notably weak

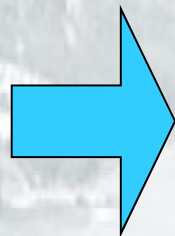
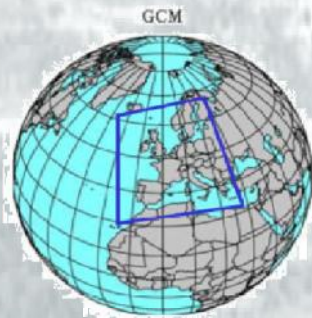
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Boundary and initial conditions are essential for accurate predictions

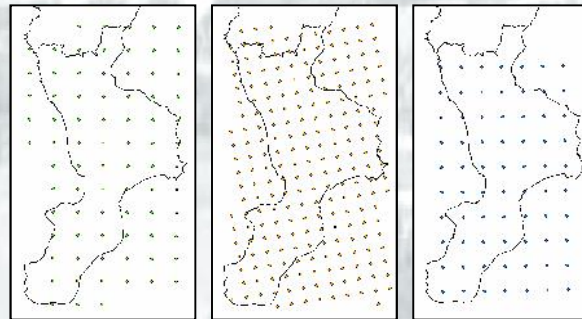
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Southern Italy – Crati River Basin

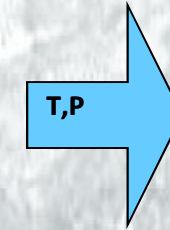
GCMs



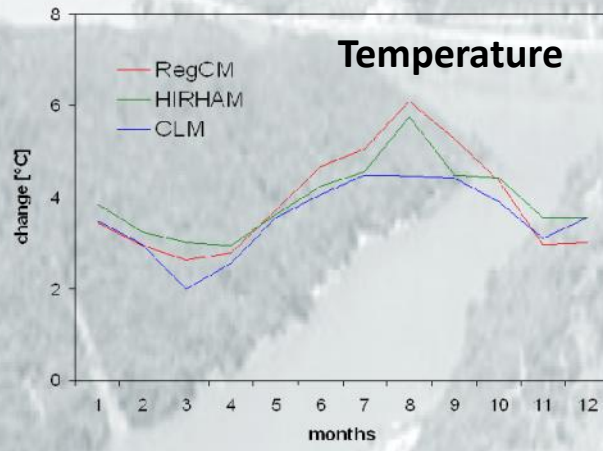
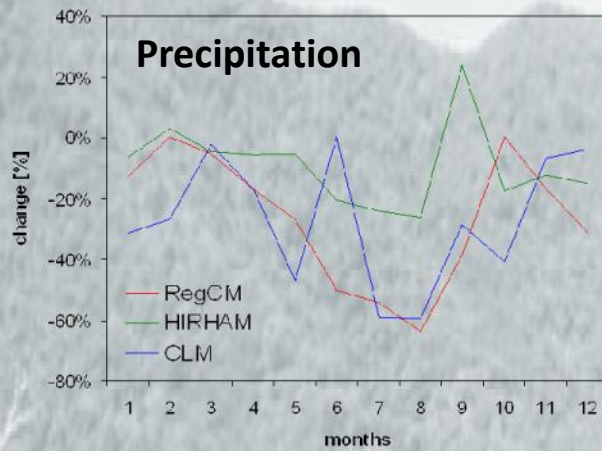
RCMs



Time slices
 1961-1990
 2071-2100

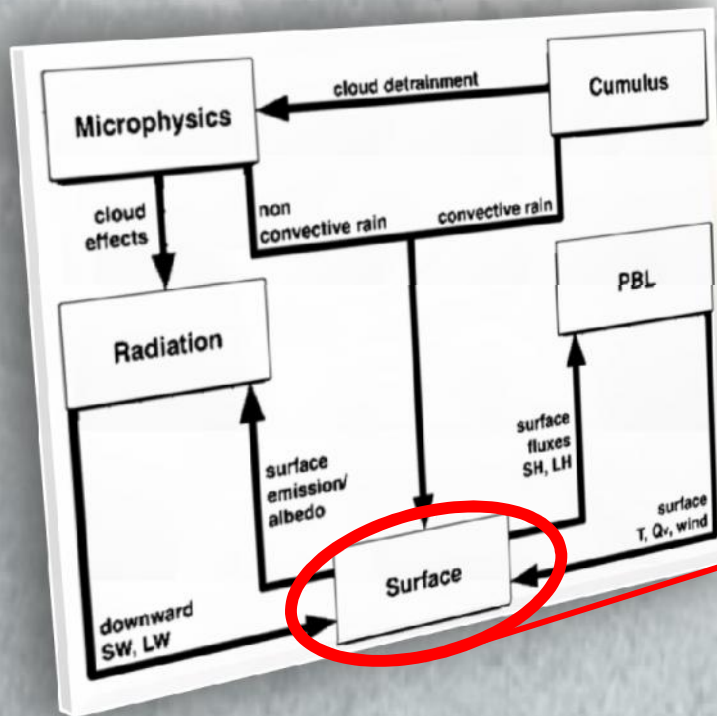


- 1) HADCM3 (UK) – Scenario A2
- 2) ECHAM5 (D) - Scenario A1B



SIMUL vs OBS
2071-2100 vs 1961-1990

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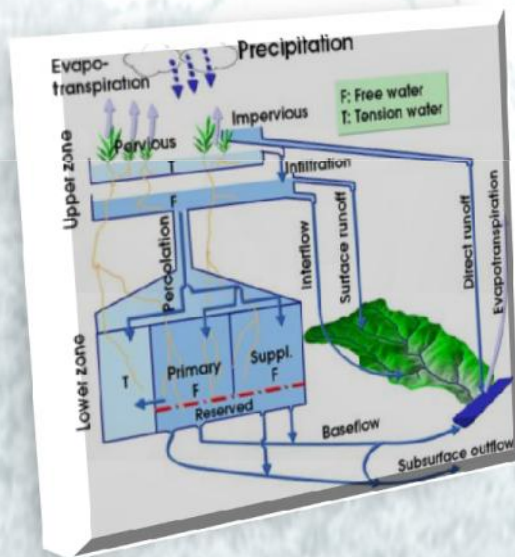
- Development of an improved parameterization of convective precipitation
- Improved description of soil moisture

Land Surface Model

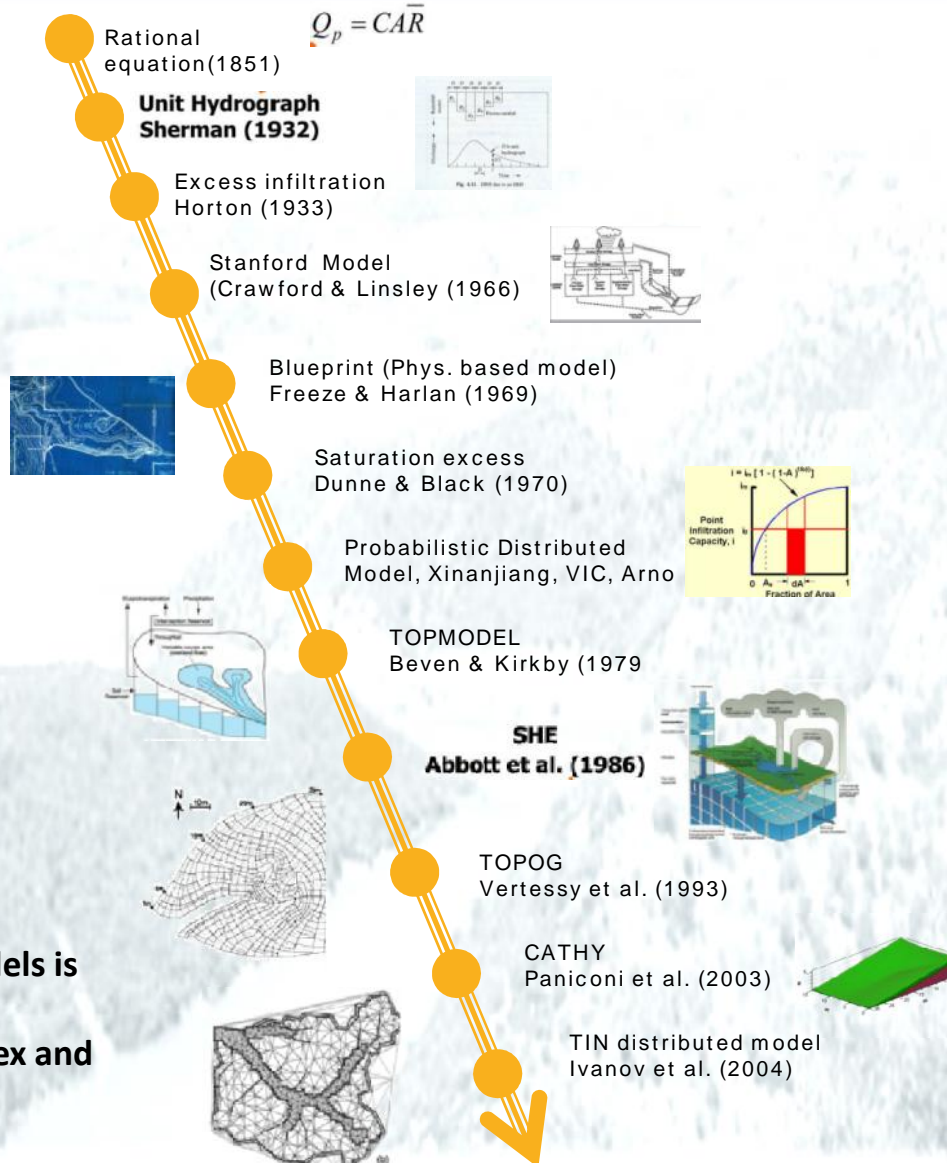
through the analysis of energy fluxes are taken into account only the first soil moisture layer, neglecting redistribution in soil and laterally

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Hydrologic water cycle



The development of physically based models is increased more and more, obtaining computational schemes ever more complex and efficient

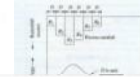


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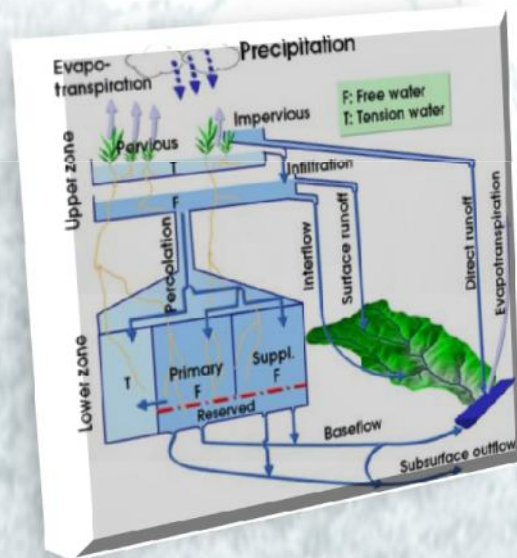
Rational equation (1851)

$$Q_p = CAR$$

Unit Hydrograph Sherman (1932)



Hydrologic water cycle



Integrate within numerical weather prediction models the knowledge of hydrological processes occurring in the first layers of soil.

The development of physically based models is increased more and more, obtaining computational schemes ever more complex and efficient



Vertessy et al. (1993)

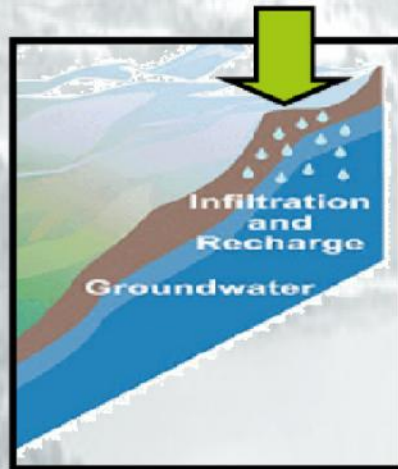
CATHY
 Paniconi et al. (2003)



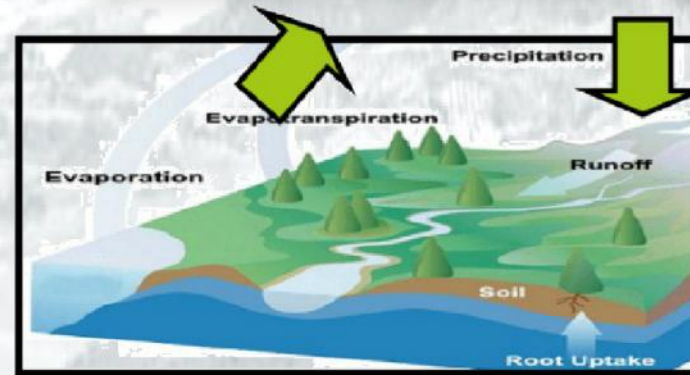
TIN distributed model
 Ivanov et al. (2004)

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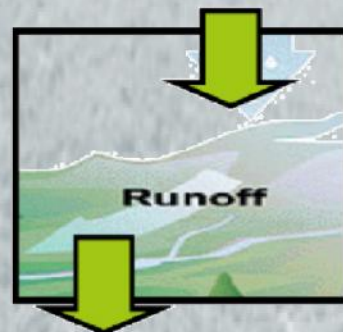
**Not integrated modeling
 (limited or no feedback)**



Groundwater/Vadose Model



Land Surface Model



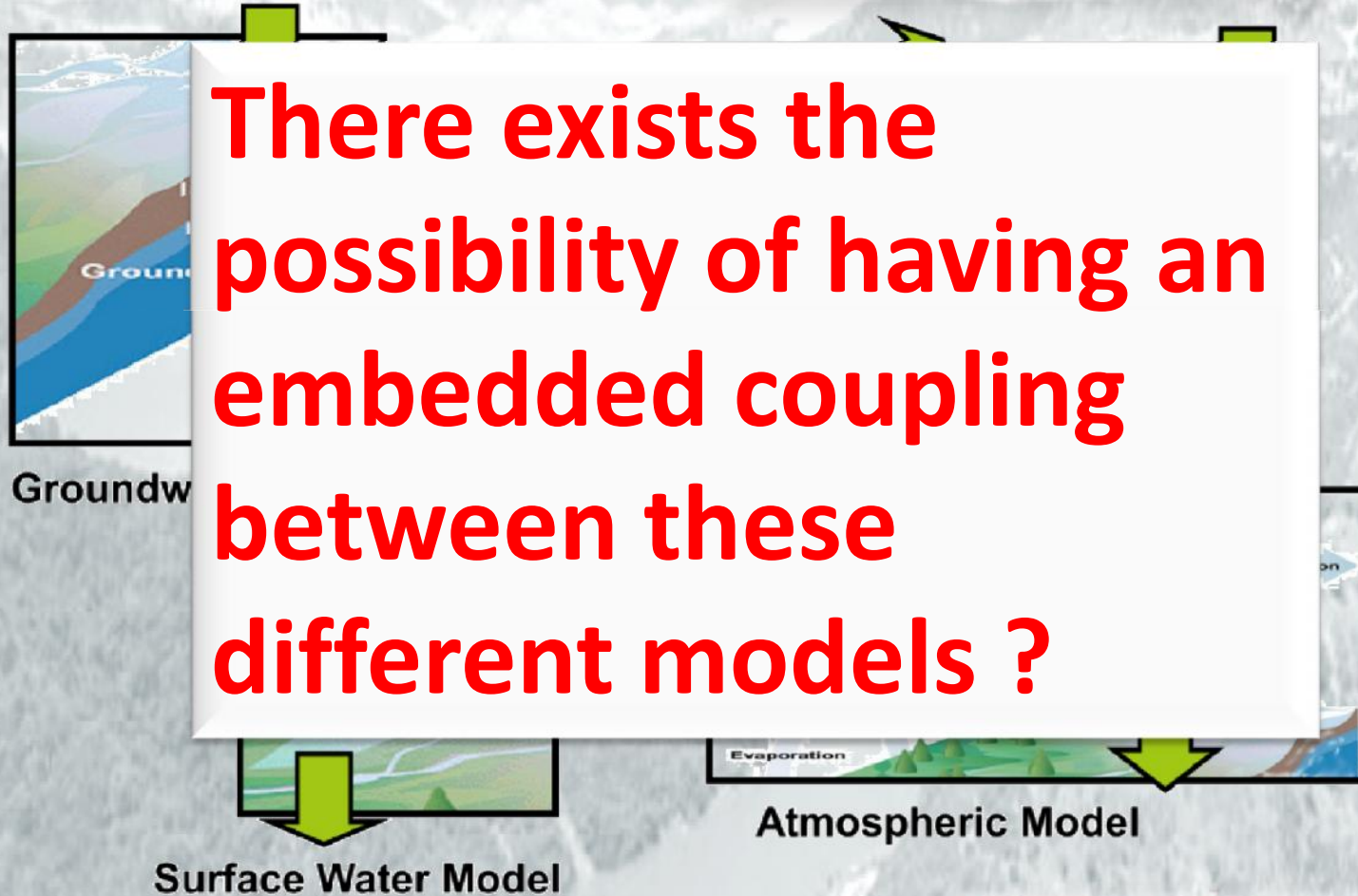
Surface Water Model



Atmospheric Model

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Not integrated modeling
(limited or no feedback)



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11
June
09:00

1st session

**Fully coupled atmo-hydro modeling
approaches: state of the art**

11
June
14:15

2nd session

**Enhancing process representation in
fully coupled modeling systems**

12
June
09:00

3rd session

**The forecasting chain and other
aspects of land-atmosphere coupling**

Different coupling approaches
WRF-Hydro applications

Modeling enhancement
Integration Tools

Forecasting issues
Environmental problems

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12
June
14:15
**Fundamentals of WRF-Hydro:
Lectures**

13
June
09:00
**Instructional session:
mini-tutorial WRF-Hydro**

Lectures held by Prof. Dave Gochis
Dr. Fersch, Senatore, Rummler

Use of WRF-Hydro Package
at the CeSMMA Computer Lab