



POLITECNICO DI MILANO

**Pianeta 3000**  
La ricerca scientifica per l'Ambiente e il Territorio

**Il cambiamento climatico e l'acqua del futuro: il caso delle Alpi**

**Intervengono:**

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- Guglielmina Diolaiti  
(Università degli Studi di Milano)
- Michael Lehning  
(Istituto neve e valanghe, SLF Davos)

**Modera:**

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(Politecnico di Milano)

**Dibattito finale.**

Mercoledì 25 maggio 2011  
Aula De Donato (già S01)  
ore 14.30



Foto di Massimo Ravera

# "I-CARE"

## Impact of Climate change on Alpine water REsources: the case of Italy and Switzerland

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1941

**Bando**



PROGETTI DI RICERCA "5 PER MILLE JUNIOR"

Anno 2009

*Proposal:*

**I CARE**

*Impact of Climate change on Alpine water REsources:  
the case of Italy and Switzerland*



Keywords: climate change, alpine area, water resources

**Proposer:**  
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*Daniele Bocchiola*

**Duration:** 24 months

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**Stakeholders**

-  EDISON
-  ENEL

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*Daniele Bocchiola*

**Inno 2009**

land - Mozilla Firefox

Ricerca avanza

Vedi anche

- LARGE & SMALL
- FlowMesh
- Indagine patologie rare del collagene
- Verso reti di accesso a banda larga
- Autismo contemporaneo Milanese, verso Expo 2015
- CINERHAT
- CATS
- MCMD
- Modelli computazionali per materiali ceramici
- Modelli CFD avanzati

# Motivation

## Mankind

Increase in surface temperatures has important consequences for the hydrological cycle in regions where water supply is currently dominated by melting snow or ice. In a warmer world, less winter precipitation falls as snow and the melting of winter snow occurs earlier in spring. Even with constant precipitation, these effects lead to a shift in peak river runoff to winter and early spring, away from summer and autumn when demand is highest. Where storage capacities are not sufficient, the winter runoff will be lost to the oceans. With more than one-sixth of the Earth's population relying on glaciers and seasonal snow packs for their water supply, the consequences of these hydrological changes for future water availability—predicted with high confidence and already diagnosed in some regions—are likely to be severe.

From: Barnett *et al.*, 2005, Nature 438, 303-309.

# ADAPTATION

??

# The European Alps



Evidence from present knowledge indicates European Alps are undergoing **noticeable and measurable** transient climate change and their hydrological cicle is impacted

Thermal shift within Alps since 1980s, albeit synchronous with global warming, seems at least twice as much global climate signal, and the Alps underwent more than  $2^{\circ}\text{C}$  increase of lowest temperatures during XX century, with substantially unchanged precipitation, but with a marked decrease of snowfall (e.g. Diaz & Bradley, 1997; Beniston, 2000; Beniston et al, 2003).

# POLIMI & Climate change



2005-2008 Integral Risk Management of Extremely Rapid Mass Movements "IRASMOS" European project. SUSTDEV-2004-3.IV.1.3 Long-term forecasting of landslides and avalanches.

2007-2009 CARIPANDA, Cambio climatico e risorsa idrica nel Parco Naturale dell'Adamello, Fondazione Cariplo.

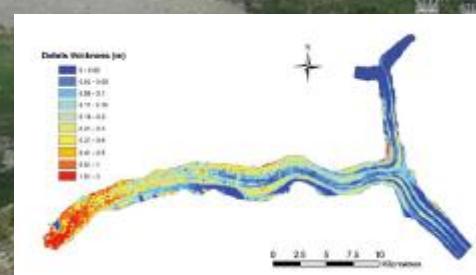
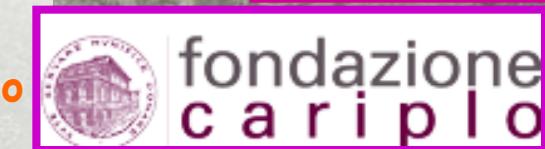
2009-2010 Budget idrologica del ghiacciaio Dossè (Valtellina, Italy). LEVISSIMA Italia.

2009-2010. IDRO-STELVIO. Una rete idrometrica per il Parco dello Stelvio, Finanziato sda Parco Stelvio.

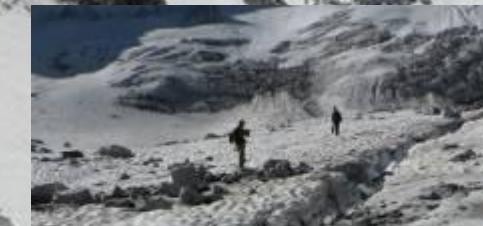
2010-2012. SHARE-Stelvio. Un Parco - Osservatorio per lo studio dei Cambiamenti Climatici e Ambientali in alta quota. Finanz. Regione Lombardia.

2010-2013. Share-Paprika. Effects of climate change on water resources in the Karakoram range (Pakistan, Asia). EVK2CNR

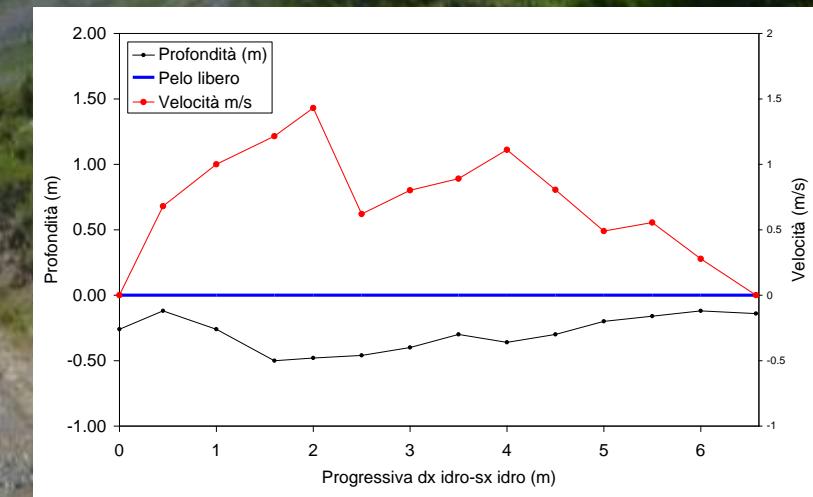
2010-2013. SEED, Social, Economic and Environmental Development for the realization of Central Karakorum National Park (CKNP). EVK2CNR



# Adamello - Venerocolo 2007-2009



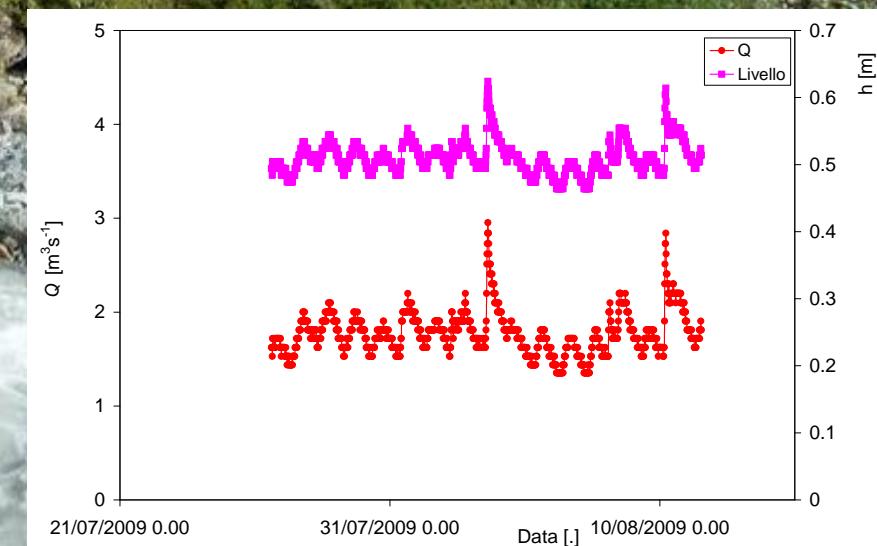
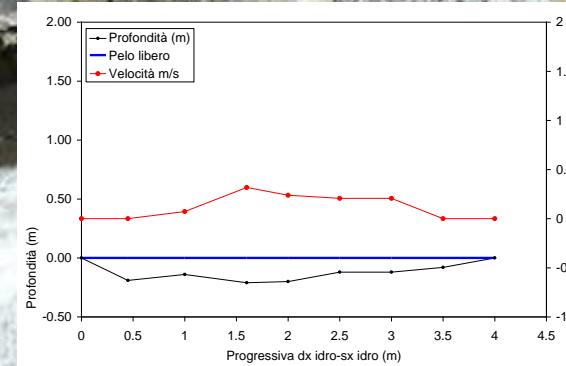
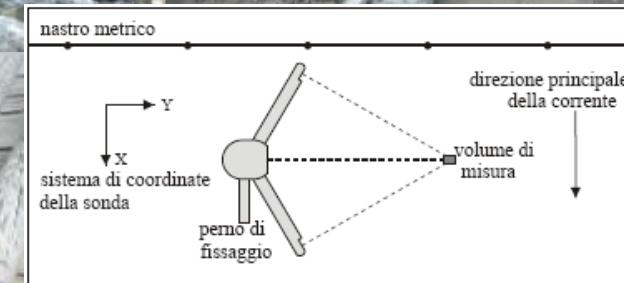
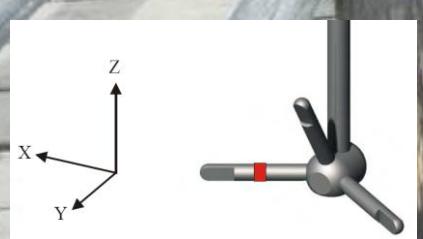
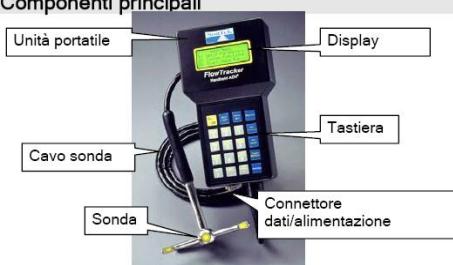
# Cima Piazzì Dosdè, 2009-2010



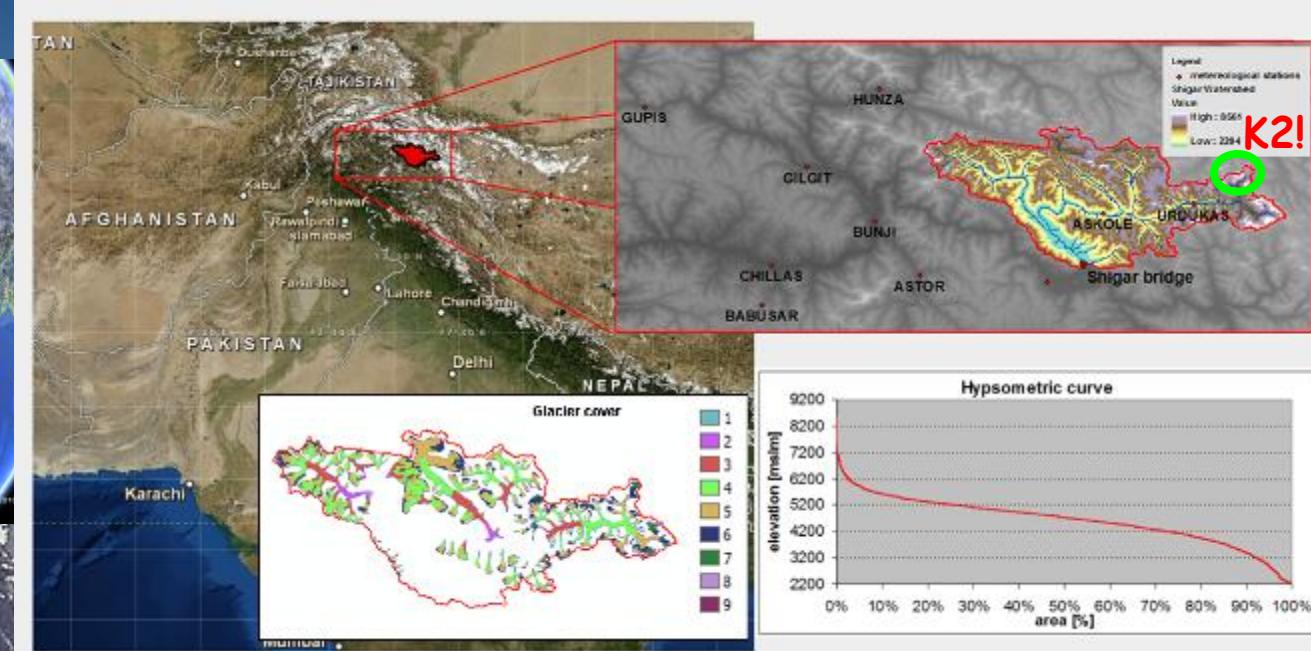
# Stelvio, 2010



Componenti principali

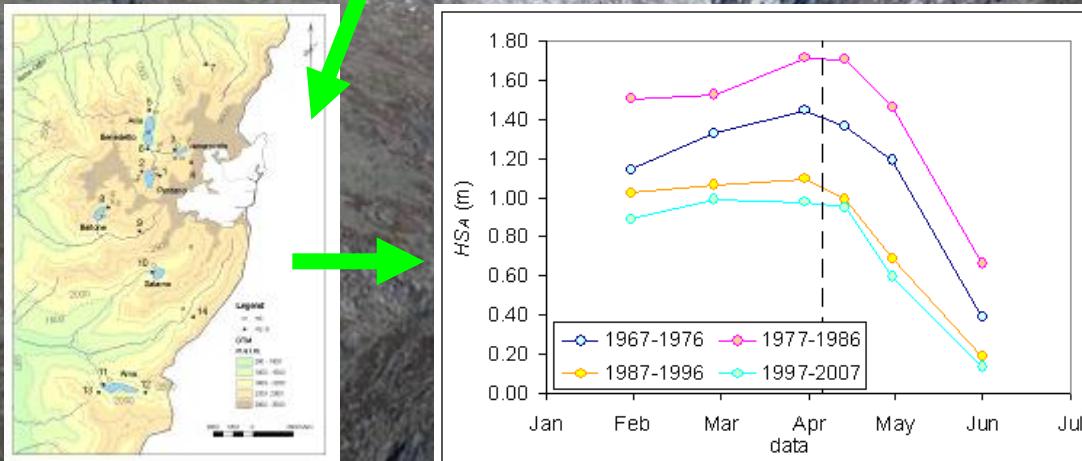
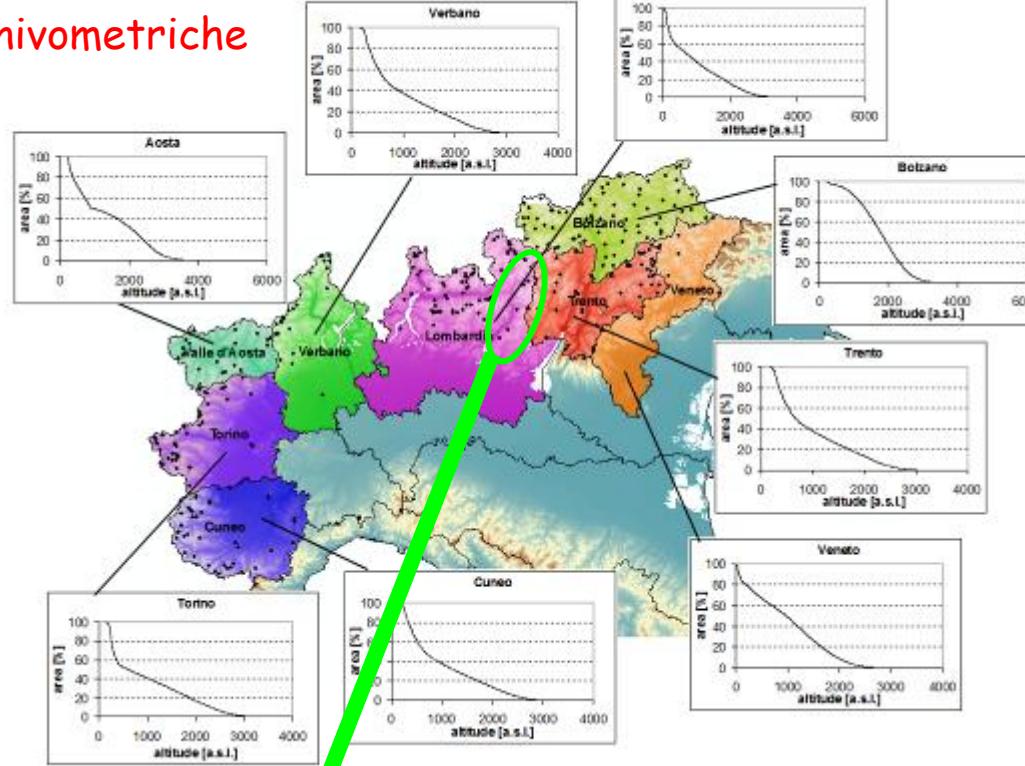


# Karakoram, 2011

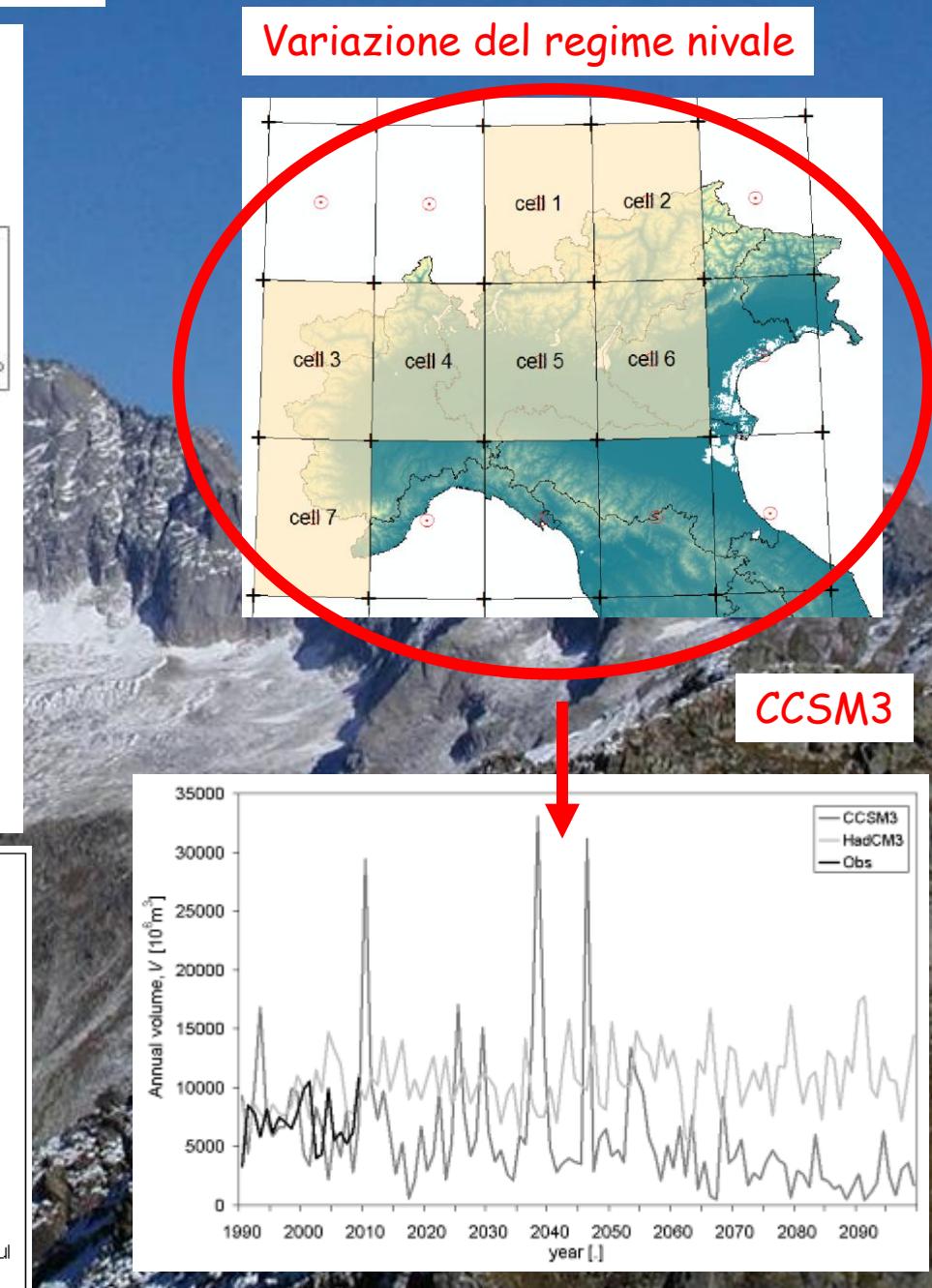


# Il progetto I-CARE

Ca. 400 stazioni  
nivometriche



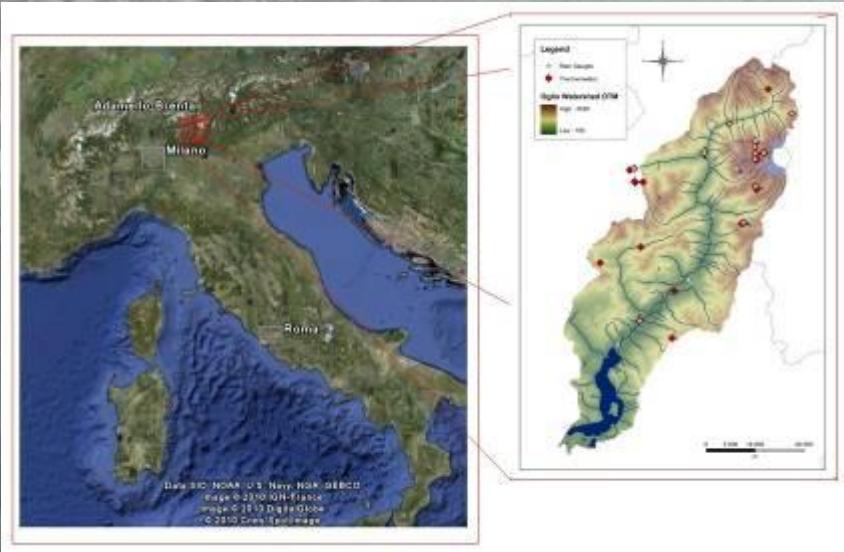
Variazione del regime nivale



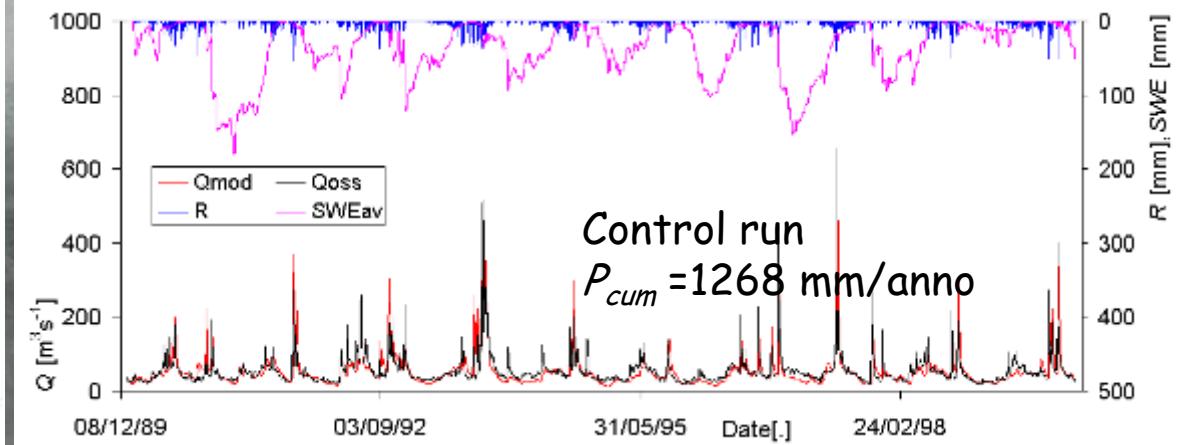
CCSM3

# Il progetto I-CARE

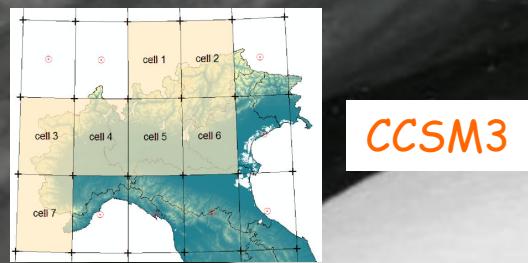
## Idrologia



## Modellazione idrologica



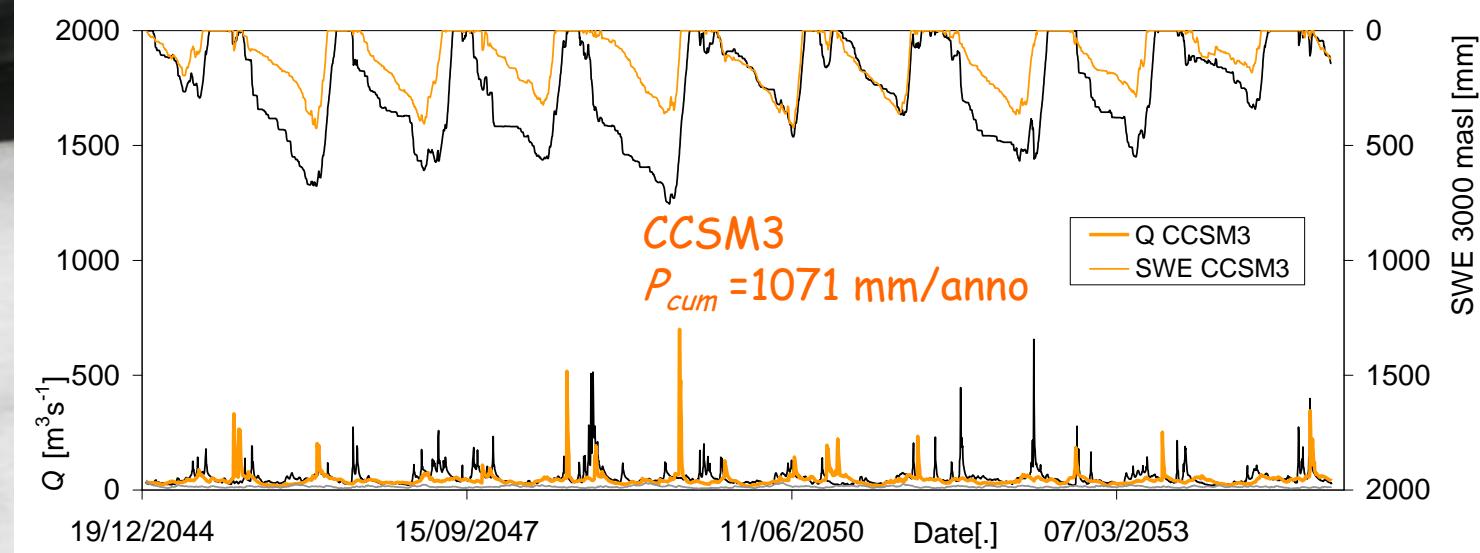
## Proiezioni di scenario



CCSM3



HadCM3



# Calvin and Hobbes

In conclusione:

*Anyone who can solve the problems of water will be worthy of two Nobel Prizes, one for Peace and one for Science..*

J. F. Kennedy, 1963

IT'S LIKE HAVING A BIG WHITE SHEET OF PAPER TO DRAW ON!

A DAY FULL OF POSSIBILITIES!

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