

CMCC, CASPUR-CINECA, ENEA, ICTP, ISAC-CNR

WP dedicato alla costruzione di un archivio dei risultati di simulazioni climatiche globali, regionali e locali, e di rianalisi oceaniche, sia già esistenti sia effettuate durante il progetto.

- Rendere disponibili i dati prodotti da modelli numerici (sia già esistenti sia prodotti durante il Progetto) mediante un sistema di archivi e portali tematici collegati al Portale Generale.
- Esperimenti numerici coordinati → scientific questions



Primo anno

- Censimento delle simulazioni numeriche globali e regionali da includere negli archivi (D2.5.1)
- Definizione dei protocolli di archiviazione dei dati numerici, della rete di sottoarchivi e delle modalità di accesso ai dati e alle procedure di trasferimento di dati di grandi dimensioni.
- Definizione e alla preparazione di specifici esperimenti numerici da eseguire durante il secondo anno del progetto: *Scientific Questions* (D2.5.2)

Organizzati quattro meeting di work-package

Attività previste per il secondo anno rimodulate in accordo ai tagli di budget:

Nel corso del secondo anno di progetto si prevede, con il contributo di tutti i partner, di:

- continuare la produzione di simulazioni numeriche globali e regionali mirate alle regioni d'interesse del progetto, che includano la dinamica degli aerosol;
- continuare la messa a disposizione del contenuto dell'archivio di dati numerici, con particolare attenzione per l'area Mediterranea, la regione Alpina e la regione HKKH;
- iniziare l'implementazione modelli numerici a scala locale, non idrostatici, per la simulazione della dinamica climatica e ambientale in zone montane con orografia complessa;
- continuare il lavoro sul downscaling statistico/stocastico con diverse attività, soprattutto mirate alla produzione di scenari futuri di precipitazione ad alta risoluzione in Italia nordoccidentale.
- avviare le attività di confronto tra diverse tecniche di downscaling dinamico, statistico e stocastico, per comprenderne le caratteristiche e i limiti di applicabilità per diversi e specifici casi studio.
- avviare la generazione di archivi di dati ad alta risoluzione, applicando le tecniche di downscaling ad osservazioni e output di modelli a bassa risoluzione (sia spaziale che temporale).

Deliverable: D2.5.3: Prima versione degli archivi di simulazioni climatiche globali e regionali resi disponibili presso i server dati dei centri partner.

Esperimenti Numerici Coordinati

L'archivio renderà disponibili anche i risultati di simulazioni ad alta risoluzione a scala regionale e locale per aree di interesse strategico per il progetto (Italia, bacino del Mediterraneo, Hindu-Kush-Karakorum-Himalaya, regione del Rwenzori), includendo sia i risultati di simulazioni puramente atmosferiche che simulazioni accoppiate mare-atmosfera per il bacino del Mediterraneo.



Le Scientific Questions (D2.5.2)

- What are the advantages and disadvantages of the different downscaling techniques commonly used to produce high quality data for impact studies in areas with a complex orography?
- What is the low-frequency component of the climate variability that characterizes the Mediterranean area?
- What is the role of low-frequency natural variability in modulating the long-term trend observed and projected for the **hydrologic cycle in the Alpine region**?
- How can we improve models of severe hydro-meteorological events in areas with complex topography?
- What is the role of model spatial resolution in simulating the effects of the Andes on the regional atmospheric circulation and represent its interaction with the large-scale variability (e.g., ENSO)?

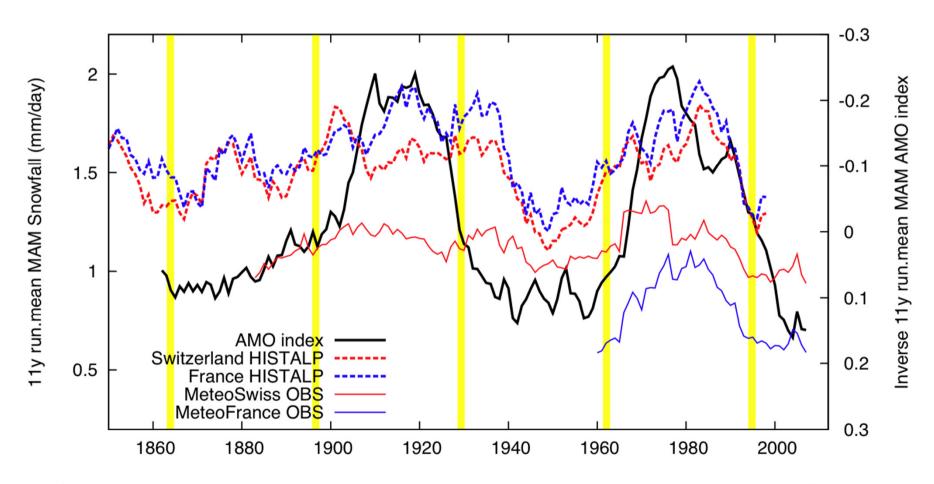
NExtData Annual Meetin, Roma, 12 Novembre 2013

Queste *Scientific Questions* sono emerse dalla discussione (svolta nel WP) su un set di problemi scientifici più generali e rilevanti per il progetto:

- Downscaling of climate simulations for the Alpine region
- ➤ Climate variability of the Mediterranean region with particular focus on the long (multi-annual and decadal) time-scales
- ➤ Simulation and reproduction of the main climatic features of regions with complex orography, such as Hindu-Kush-Karakorum—Himalaya, Andes, Alps:

E rappresentano il contributo che WP2.5 dà alle Grand Challenges

HISTALP vs. Observations low-frequency



correlations About 0.5

Zampieri et al. (2013)

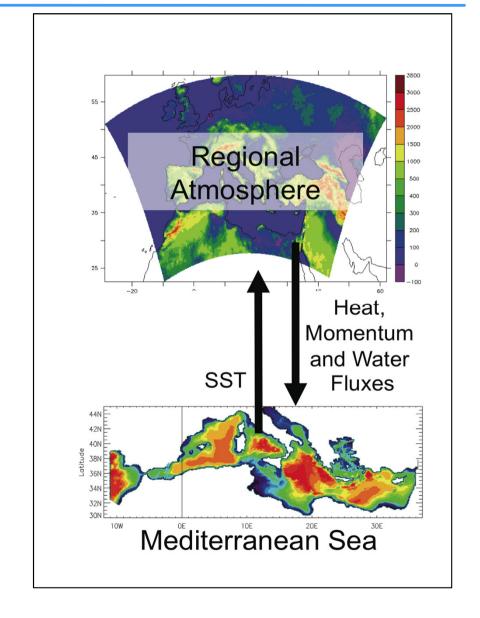




Cosmo-CLM 4.8
horizontal resolution 50km
deltat=240"
vlevs=40
MEDCORDEX domain+atlantic box

Oasis 3 CMCC parallel version coupling frequency 4800"

Nemo 3.4 (MFS) horizontal resolution 1/16 deltat=600"





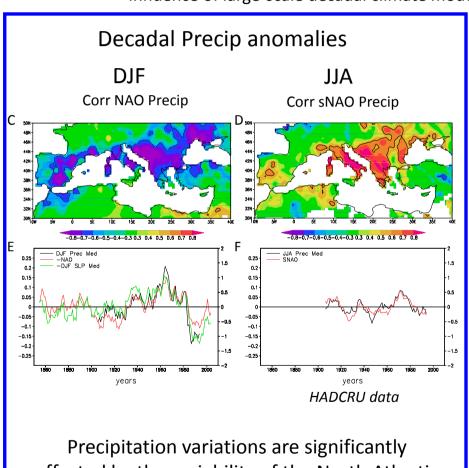


Decadal variability in ENEA-PROTHEUS ERA40 simulation (CIRCE)

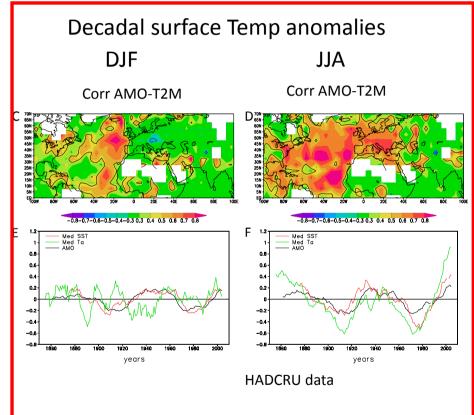


Mariotti and Dell'Aquila 2011, Clim. Dyn.

Influence of large-scale decadal climate modes on Mediterranean Region in observations



Precipitation variations are significantly affected by the variability of the North Atlantic Oscillation via modifications in sea level pressure and associated circulation anomalies



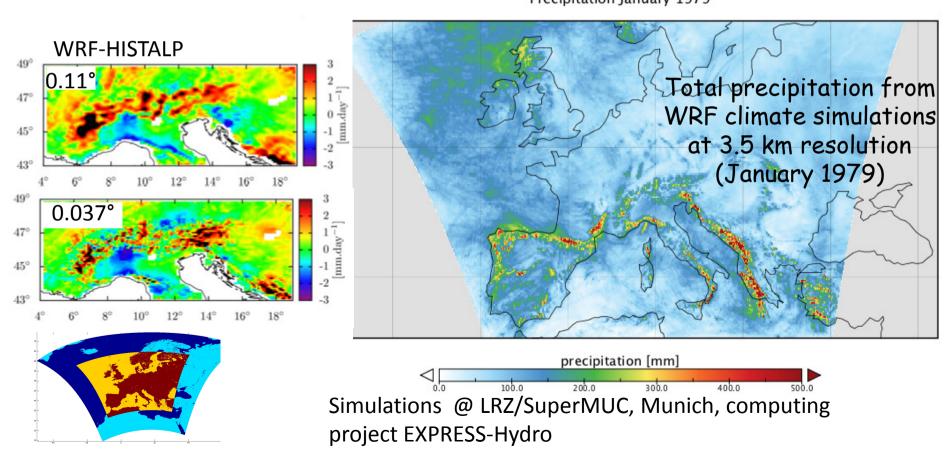
Atlantic Multidecadal Oscillation seems to have a large influence on Mediterranean surface air temperatures and SST in JJA

High-resolution (3.5 km) dynamical downscaling of global scenarios over Europe



- 30-yr present (1979-2008). Large scale drivers EC-Earth and ERA-Interim (30 years with ERA-Interim done)
- 30-yr projection (2021-2050 RCP 4.5) large scale driver EC-Earth, to be completed by May 2014.

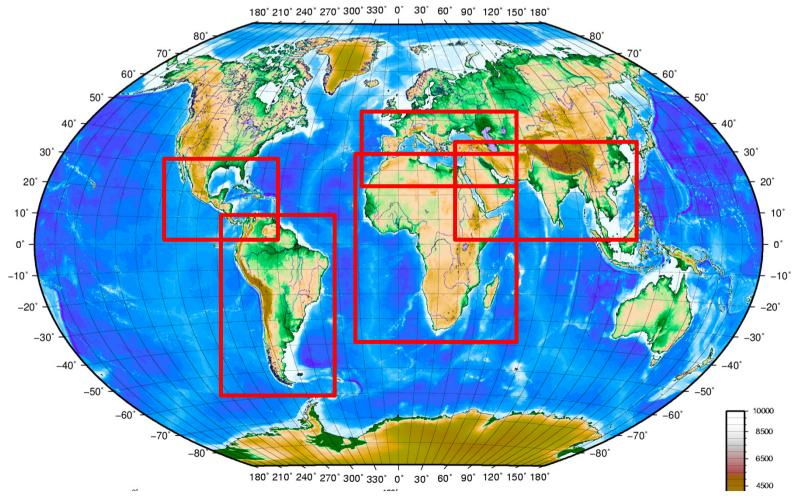
 Precipitation January 1979



NExtData Annual Meetin, Roma, 12 Novembre 2013

ICTP Regional Climate domains







RECCOREgional Climate in Complex Orography

Development of ensembles of regional climate change scenarios, with focus on variability, extremes and uncertainties in areas of complex topography





NExtData Annual Meetin, Roma, 12 Novembre 2013

Unit 1: Institute of Atmospheric Sciences and Climate (ISAC),

(CNR Silvia Trini Castelli and Antonio Parodi

coordinating

Institute)

Unit 2: Abdus Salam International Centre for Theoretical Physics (ICTP)

Filippo Giorgi

Unit 3: Cineca

Giovanni Erbacci

Unit 4: Institute of Methodologies for Environmental Analysis (IMAA)

Fabio Madonna



The AIM

improving the physical understanding of the changes in climatological regimes over the NextData regions of interest, with the support of their meteorological characterization.

The RATIONALE

The variability and uncertainties of climate and meteorology of the interest areas (Hindu-Kush Karakorum, Alps and Mediterranean region) will be studied with a suite of regional climate models (RCMs) integrated with mesoscale meteorological models.

Each modelling system will be used at different spatial scales, from regional to local, yielding a unique multi-scale modelling framework.

Main result and deliverable

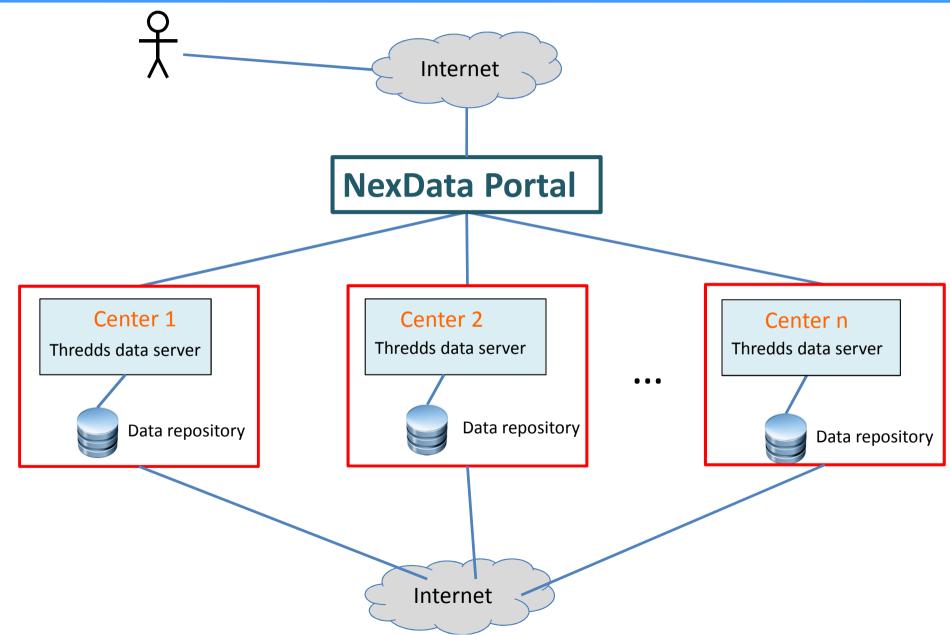
The project will result in an unprecedented set of regional climate model simulations for the Alpine and Mediterranean regions, Hindu-Kush Karakorum, and possibly other areas of interest, obtained using a chain of modelling systems operating at different scales.

The end deliverable of the project is the inclusion of the output from these scenarios and meteorological simulations into the NextData data repository, following the NextData data format, and therefore making them available to the scientific community.

Archivi e accesso ai dati dalle simulazioni

Rendere disponibili i dati prodotti da modelli numerici (sia già esistenti sia prodotti durante il Progetto) mediante un sistema di archivi e portali tematici collegati al Portale Generale.

NExtData Annual Meetin, Roma, 12 Novembre 2013



NExtData Annual Meetin, Roma, 12 Novembre 2013

Server Thredds sperimentale in servizio presso ISAC-CNR – accesso ai dati EC-Earth CMIP5 e diversi dataset climatici



Catalog http://sansone.to.isac.cnr.it:8080/thredds/catalog/EC-Earth_CMIP5/rcp85/day/atmos/tas/r8i1p1/catalog.html

Dataset: r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc

- · Data size: 1.870 Gbytes
- Data type: GRID
- ID: EC-Earth_CMIP5/rcp85/day/atmos/tas/r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc

Access:

- 1. OPENDAP: /thredds/dodsC/EC-Earth_CMIP5/rcp85/day/atmos/tas/r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc
- 2. HTTPServer: /thredds/fileServer/EC-Earth CMIP5/rcp85/day/atmos/tas/r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc
- 3. WMS: /thredds/wms/EC-Earth_CMIP5/rcp85/day/atmos/tas/r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc
- 4. NetcdfSubset: /thredds/ncss/grid/EC-Earth_CMIP5/rcp85/day/atmos/tas/r8i1p1/tas_day_EC-Earth_rcp85_r8i1p1_20760101-21001231.nc

Dates:

• 2012-01-23 10:48:00Z (modified)

Viewers:

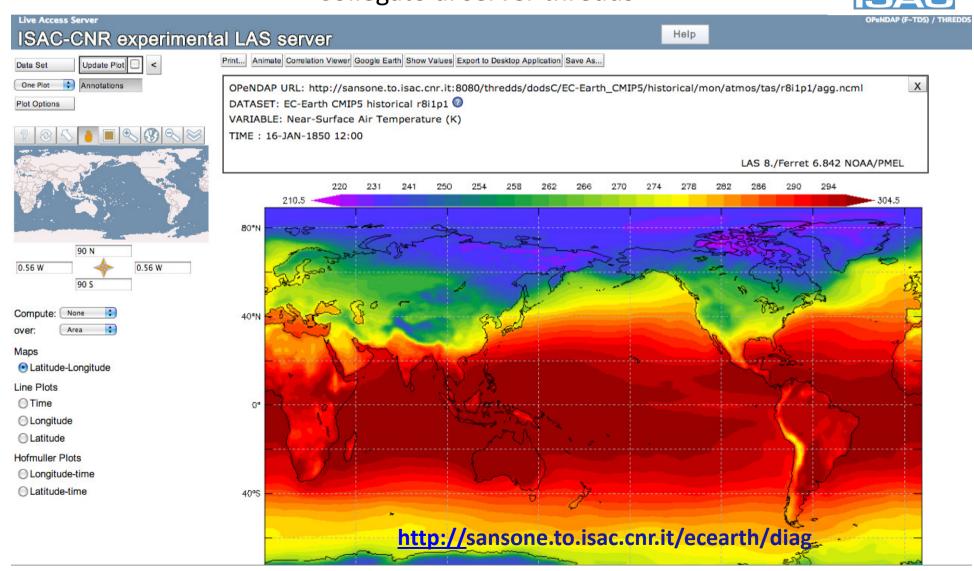
- · Integrated Data Viewer (IDV) (webstart)
- NetCDF-Java ToolsUI (webstart)
- · Godiva2 (browser-based)



NExtData Annual Meetin, Roma, 12 Novembre 2013

Server LAS sperimentale attivo presso ISAC Collegato al server thredds







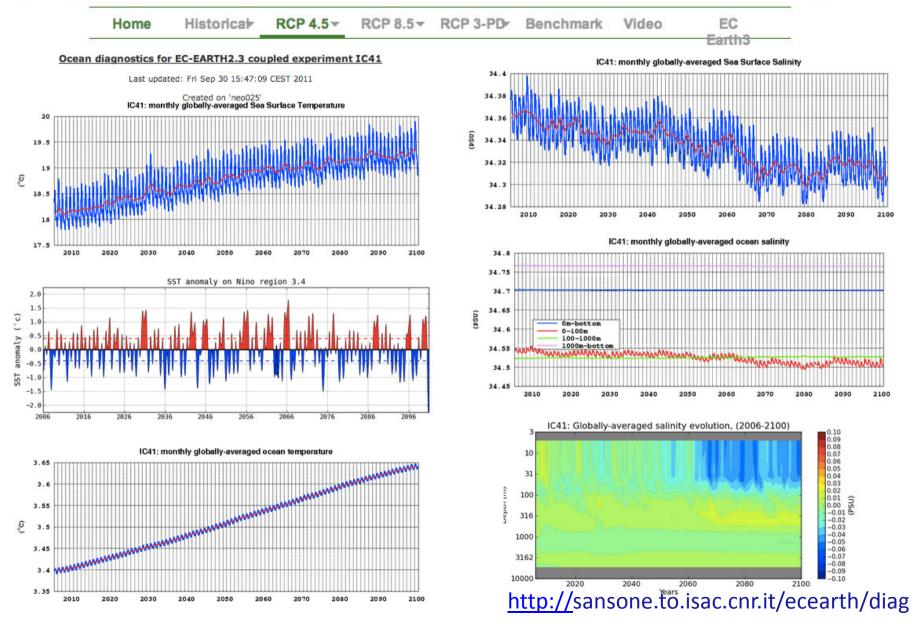
Altri strumenti diagnostici e di analisi presso ISAC-CNR

Atmospheric and oceanic diagnostics



EC-EARTH RCP 4.5 Simulation - Ocean







AMWG Diagnostic Package for climate simulations



AMWG Diagnostics Package

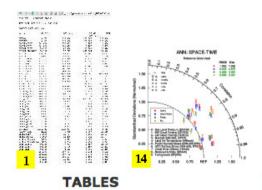
itr1



Plots Created
Thu Jul 4 18:20:48 CEST 2013
AMWG - EC-Earth interface by
Laurent Brodeau (MISU) 2012

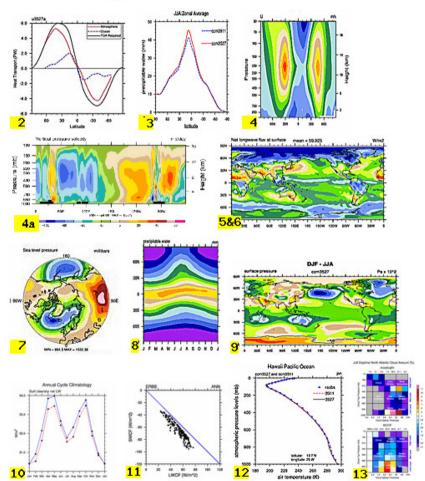
Set Description

- 1 Tables of ANN, DJF, JJA, global and regional means and RMSE.
- 2 Line plots of annual implied northward transports.
- 3 Line plots of DJF, JJA and ANN zonal means
- 4 Vertical contour plots of DJF, JJA and ANN zonal means
- 4a Vertical (XZ) contour plots of DJF, JJA and ANN meridional means
- 5 Horizontal contour plots of DJF, JJA and ANN means
- 6 Horizontal vector plots of DJF, JJA and ANN means
- 7 Polar contour and vector plots of DJF, JJA and ANN means
- 8 Annual cycle contour plots of zonal means
- 9 Horizontal contour plots of DJF-JJA differences
- 10 Annual cycle line plots of global means
- 11 Pacific annual cycle, Scatter plot plots
- 12 Vertical profile plots from 17 selected stations
- 13 Cloud simulators plots
- 14 Taylor Diagram plots
- 15 Annual Cycle at Select Stations plots



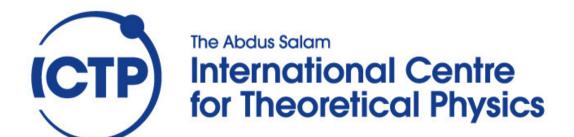
METRICS







ICTP Regional Climate Model Simulations for NextData

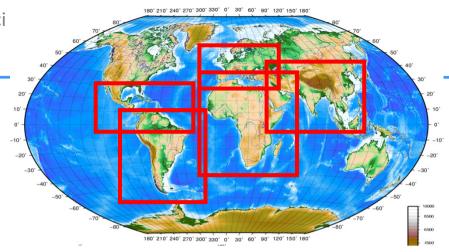


Laura Mariotti mariotti@ictp.it

WP2.5 - "Archivio digitale di dati numerici

NExtData Annual Meetin, Roma, 12 Novembre 2013

ICTP Regional Climate Simulations



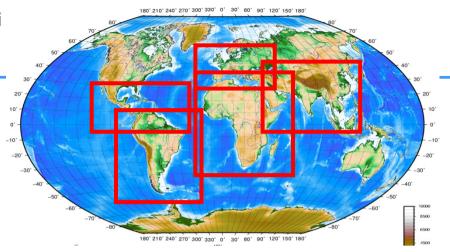
Already copied To Cineca			
Domain	Boundary conditions	Resolution	period
MED-44	HadGEM scenarios: RCP4.5, RCP8.5	50 km	1970-2100
MED-44	MPI ECHAM6 scenario RCP8.5	50 km	1970-2100
AFR-44	HadGEM scenarios: RCP4.5, RCP8.5	50 km	1970-2100
AFR-44	MPI ECHAM6 scenario RCP8.5	50 km	1970-2100

In Post-Processing			
Domain	Boundary conditions	Resolution	period
Central America	HadGEM scenarios: RCP4.5, RCP8.5	50 km	1970-2100
Central America	MPI ECHAM6 scenario RCP8.5	50 km	1970-2100
South America	HadGEM scenarios: RCP4.5, RCP8.5	50 km	1970-2100
South America	GDFL, scenario RCP8.5	50 km	1970-2100
South America	MPI ECHAM6 scenario RCP8.5	50 km	1970-2100

WP2.5 - "Archivio digitale di dati numerici

NExtData Annual Meetin, Roma, 12 Novembre 2013

ICTP Regional Climate Simulations



0.111				
Still	ш	IIIn	nı	na
Juli		чп		

Domain	Boundary conditions	Resolution	period
MED-44	RegCM 4.3 (driven by HadGEM RCP8.5)	12 km	1970-2085

To be redone

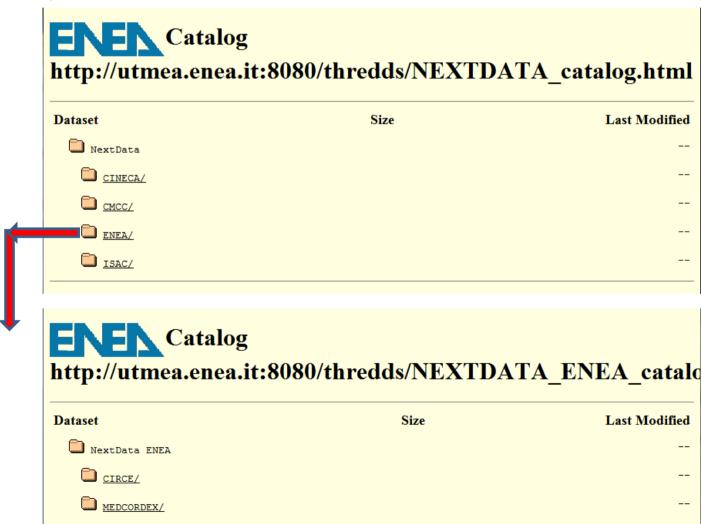
Domain	Boundary conditions	Resolution	period
South Asia	ERA-Interim	50 km 25 km 12 km	1979-2010
South Asia	GFDL scenarios: RCP8.5	50 km	1970-2100
South Asia	MPI ECHAM6 scenario RCP8.5	50 km	1970-2100



ENEA NextData TDS

THREDDS Data Server [Version 4.3.17 - 20130607.1641]

http://utmea.enea.it/nextdata



ENEA NextData TDS

MEDCORDEX

90828 file per 1.3 TB

MED-088	GB 164
MED-11	GB 340
MED-18	GB 0.8
MED-22	GB 78
MED-44	GB 662
MED-44i	GB 96

CIRCE

7146 file per 1.1 TB

EH5OM_20C3M GB 350 EH5OM_A1B GB 349 ERA40_1 GB 81 ERA40_2 GB 303



Progetto NextData, WP 2.5

The CMCC data platform

Dr. Osvaldo MarraSCO Division – HSM group leader

prof. Giovanni Aloisio
Head of the Scientific Computing & Operations Division



Data Platform design and implementation

The design of the CMCC data platform has taken into account **key requirements** like:

- efficient, scalabe and transparent access to large volumes of scientific data
- metadata management (analysis of existing approaches/schemas)

Data centric approach: the same data is available through different access interfaces providing different features

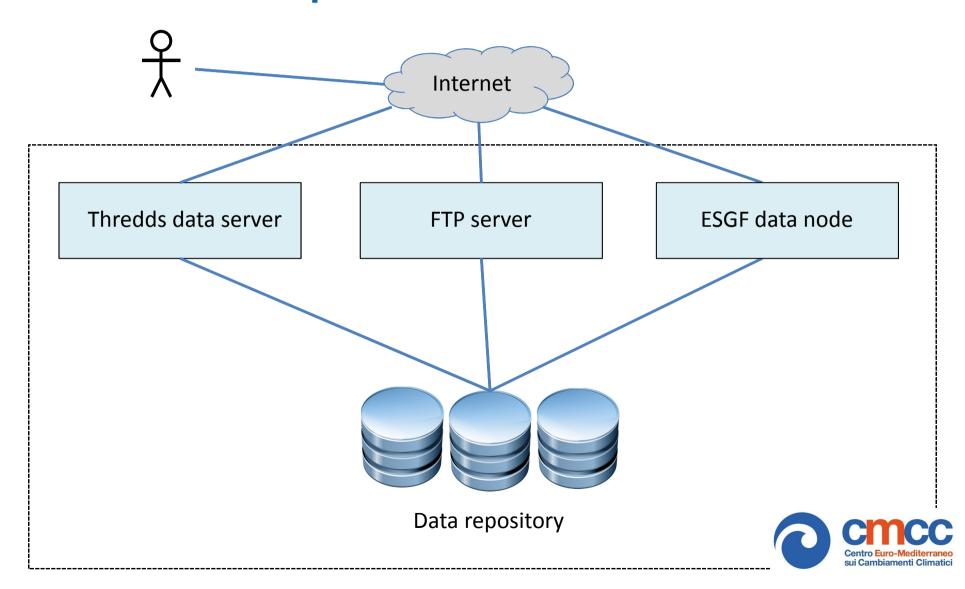
The data platform is a "collection of services" running on multiple VMs:

- "general purpose" services : HTTP/FTP
- "domain-based" services:
 - OPeNDAP/THREDDS
 - ESGF data node



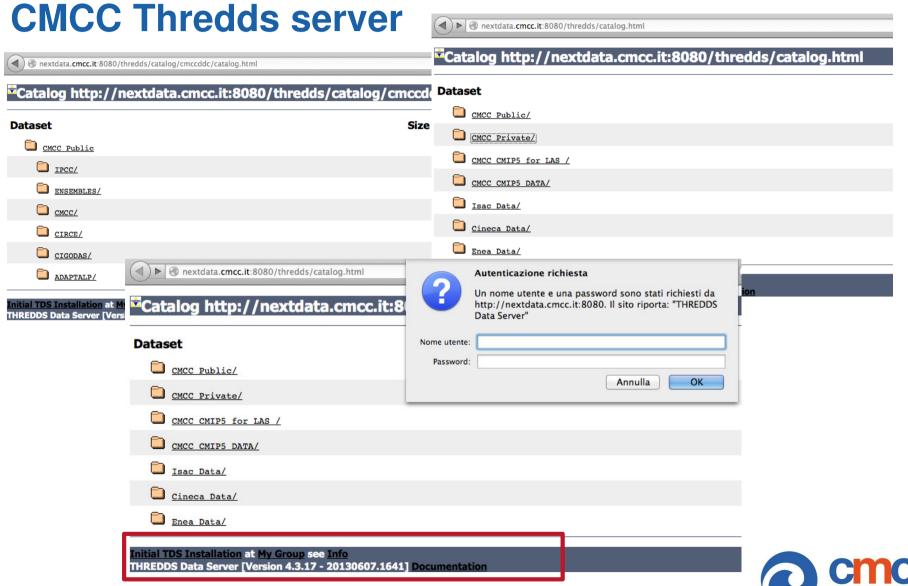


The CMCC data platform





NExtData Annual Meetin, Roma, 12 Novembre 2013







NExtData Annual Meetin, Roma, 12 Novembre 2013

CMCC Thredds server: services available



mextdata.cmcc.it:8080/thredds/catalog/cmccddc/IPCC/IPSL-CM4/catalog.html?dataset=CMCC_Public_dataset_scan/IPCC/IPSL-







Initial TDS Installation

THREDDS Data Server

Catalog http://nextdata.cmcc.it:8080/thredds/catalog/cmccddc/IPCC/IPSL-CM4/catalog.html

Dataset: IPSL-CM4/IPCM4 20C3M 1 pr 1961-1990.nc

- Data format: netCDF
- Data size: 335.8 Kbytes
- Data type: GRID
- ID: CMCC Public dataset scan/IPCC/IPSL-CM4/IPCM4 20C3M 1 pr 1961-1990.nc

Access:

- 1. OPENDAP: /thredds/dodsC/cmccddc/IPCC/IPSL-CM4/IPCM4 20C3M 1 pr 1961-1990.nc
- 2. HTTPServer: /thredds/fileServer/cmccddc/IPCC/IPSL-CM4/IPCM4 20C3M 1 pr 1961-1990.nc
- 3. WCS: /thredds/wcs/cmccddc/IPCC/IPSL-CM4/IPCM4_20C3M_1_pr_1961-1990.nc
- 4. WMS: /thredds/wms/cmccddc/IPCC/IPSL-CM4/IPCM4_20C3M_1_pr_1961-1990.nc
- NetcdfSubset: /thredds/ncss/grid/cmccddc/IPCC/IPSL-CM4/IPCM4 20C3M 1 pr 1961-1990.nc

Dates:

2007-11-29T16:55:06Z (modified)

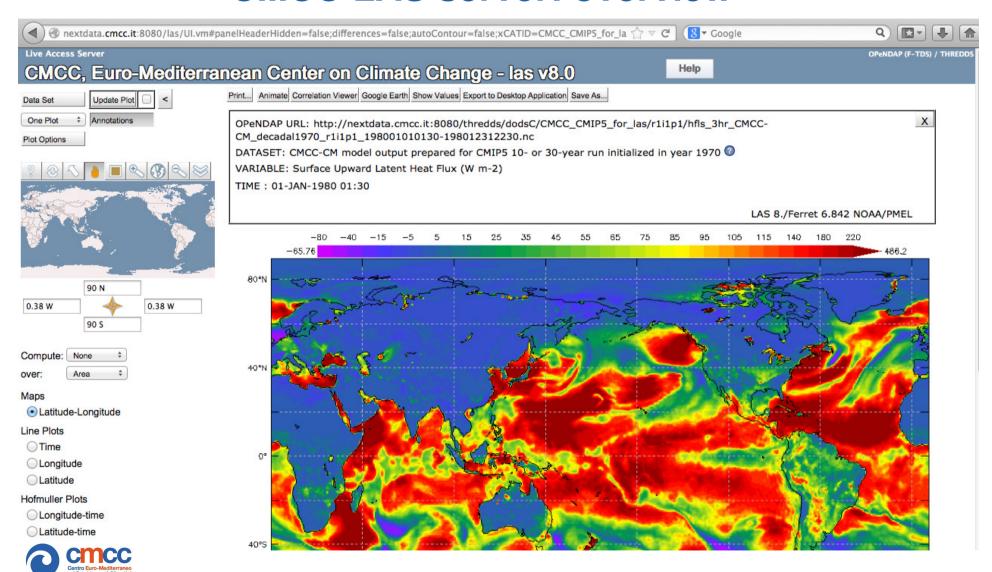
Viewers:

- · Godiva2 (browser-based)
- · NetCDF-Java ToolsUI (webstart)
- Integrated Data Viewer (IDV) (webstart)



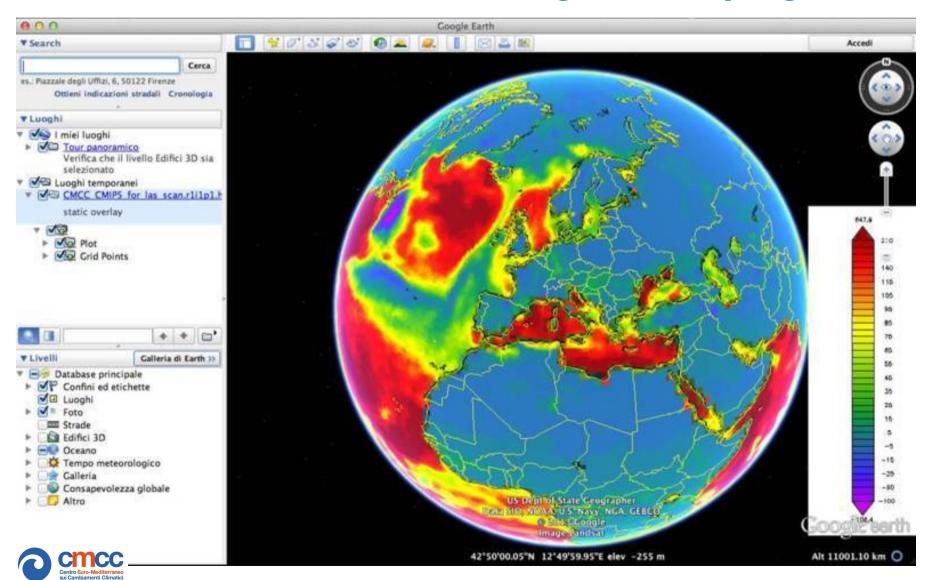
NExtData Annual Meetin, Roma, 12 Novembre 2013

CMCC LAS server: overview



NExtData Annual Meetin, Roma, 12 Novembre 2013

CMCC LAS server: Google Earth plugin





NExtData Annual Meetin, Roma, 12 Novembre 2013

grazie