LIFE14CCA/IT/001280
With the contribution of the LIFE financial instrument of the European Community

Presentazione Scenario Climatico per le 3 Regioni Pilota AB – MA – ER

Carlo Cacciamani, Arpae-Simc

Lead Partner

Partner

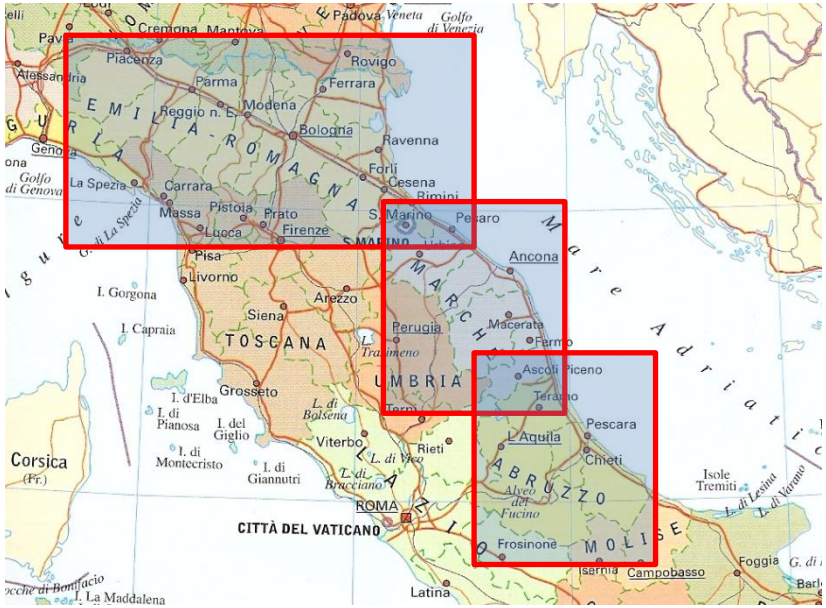
Regione Emilia-Romagna
Agenzia per la sicurezza territoriale e la protezione civile

Regione Emilia-Romagna
Direzione Generale
Cura del Territorio e dell'Ambiente

LIFE PRIMES - Preventing flooding RIsks by Making resilient communitiES

LIFE14 CCA/IT/001280

COORDINATOR	Agenzia regionale di Protezione Civile - Regione Emilia-Romagna
TYPE OF ORGANISATION	Regional authority
DESCRIPTION	The regional civil protection agency in Emilia-Romagna aims to protect people, property and the environment in the region from damage, or the danger of damage, resulting from natural disasters and catastrophes. The agency's key activities include forecasting and preventing various risk scenarios, rescuing people, and activities aimed at overcoming emergencies.
PARTNERS	ARPA.EMR(ARPA Emilia Romagna), Italy RA(Regione Abruzzo), Italy ERregione(Regione Emilia Romagna - Direzione Generale Ambiente e Difesa del Suolo e della Costa), Italy UNIVPM(Università Politecnica delle Marche), Italy RM(Regione Marche), Italy



Obiettivi Primes: Migliorare gli EWS attraverso alcuni step logici

1. Valutare lo stato climatico dell'Area (ER/MA/AB) (attuale e scenari) e gli scenari di rischio idraulico e marino connessi al Climate Change
2. Migliorare gli EWS in ER/MA/AB
3. Coinvolgere i territori, Sindaci e cittadini
4. Ottimizzare i piani di emergenza attraverso una attiva partecipazione delle comunità: piani civici

Che c'entra il clima col rischio?

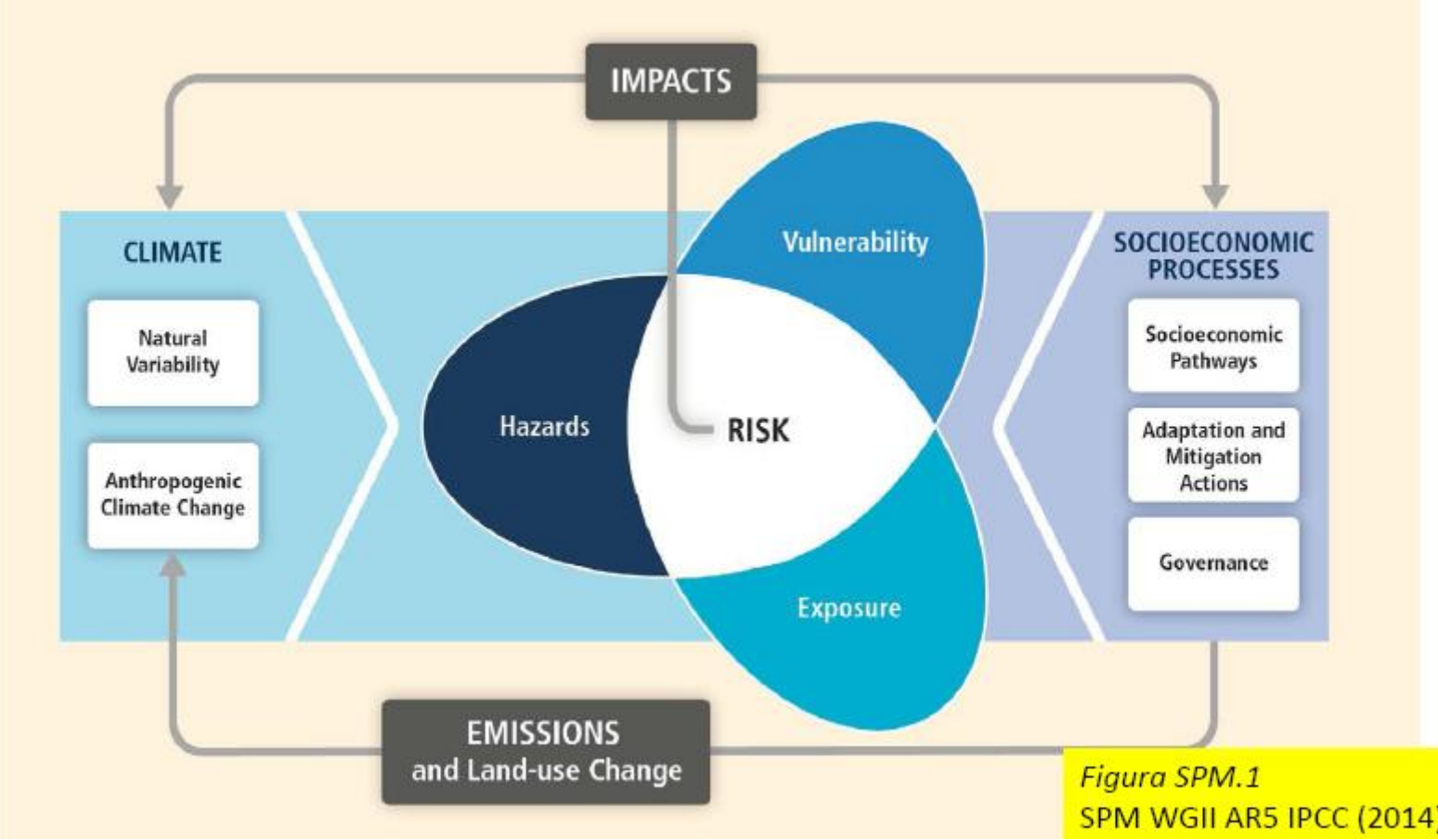


Figura SPM.1
SPM WGII AR5 IPCC (2014)

Anche in Italia il clima è cambiato ?

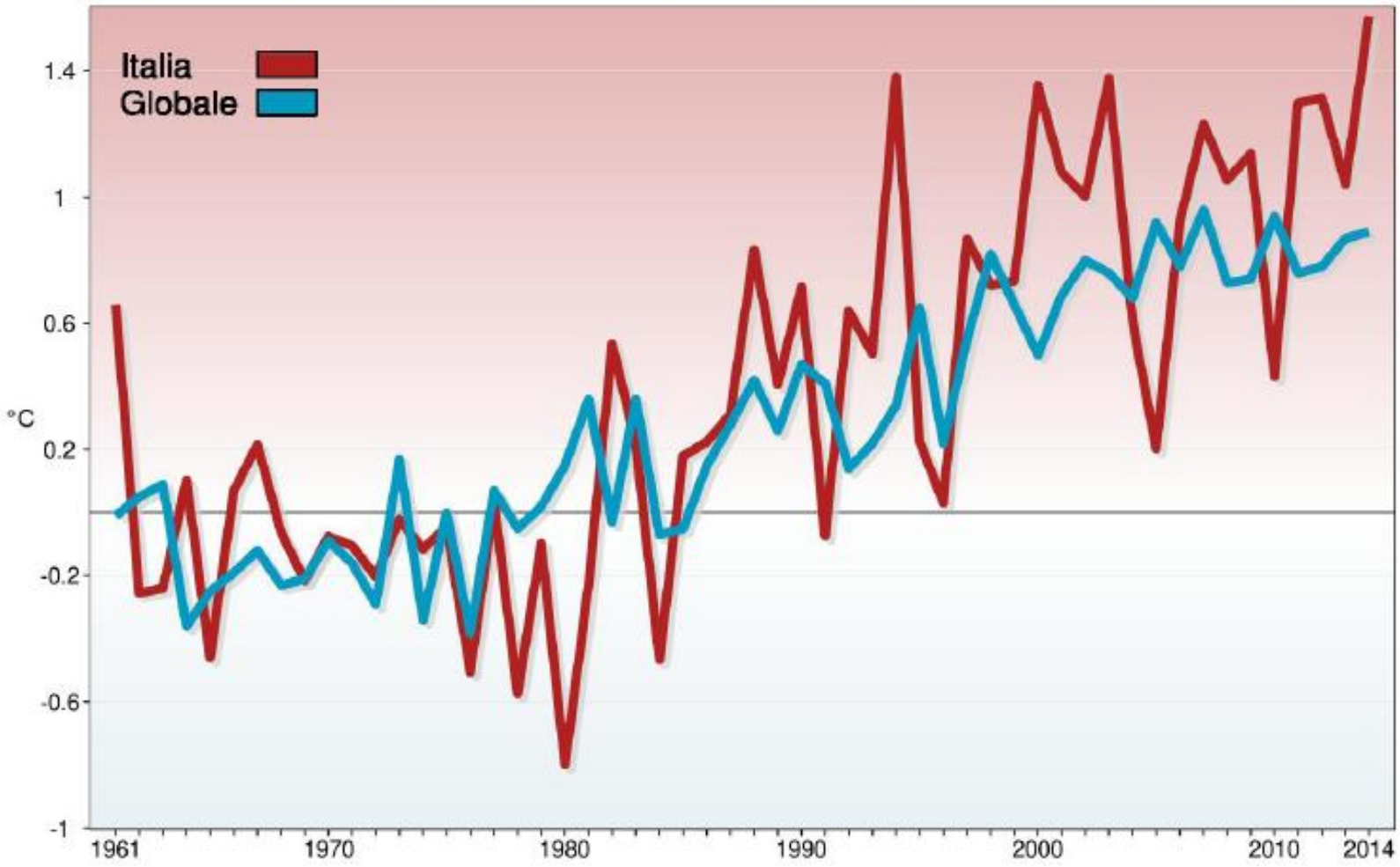
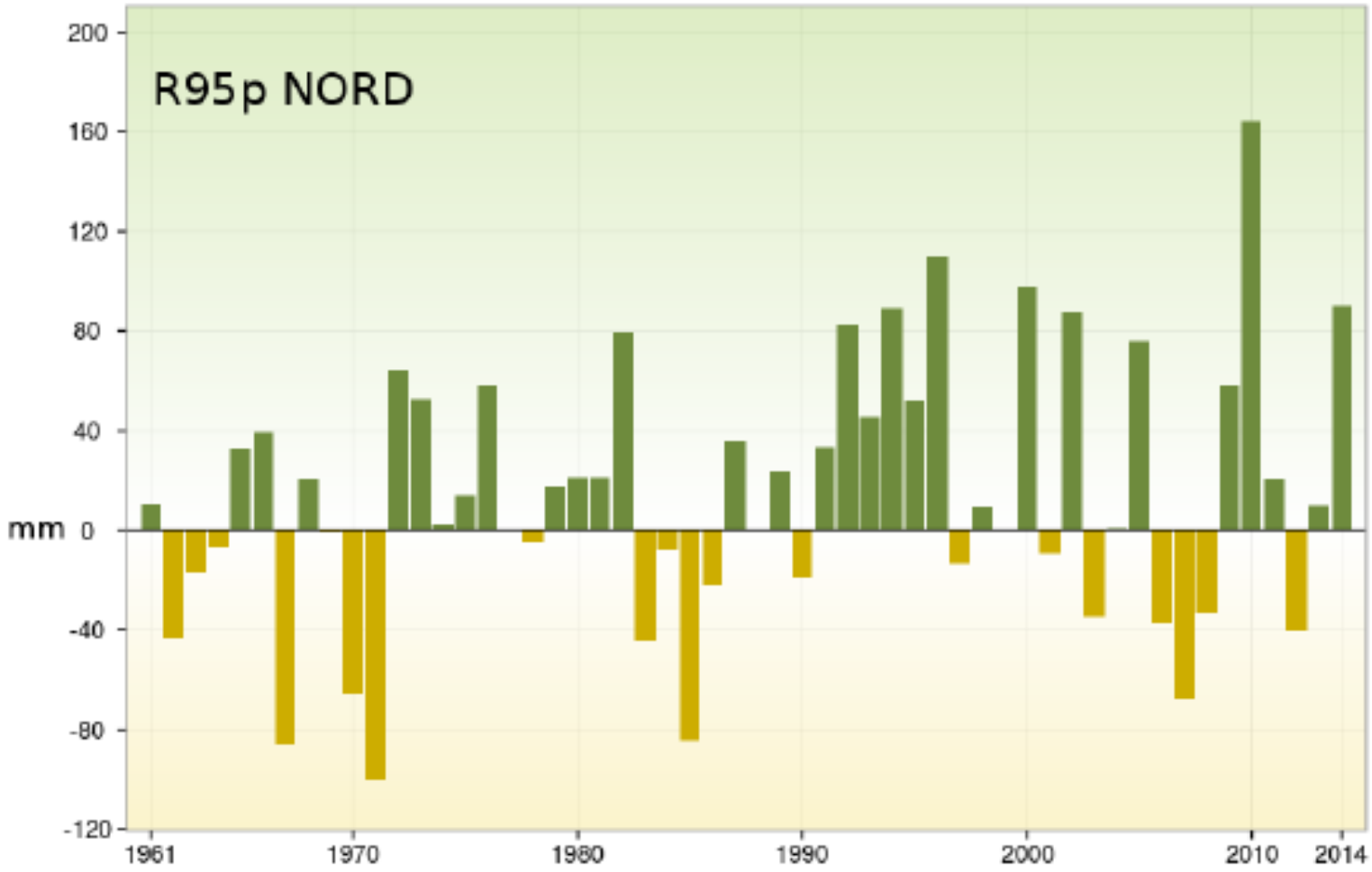


Figura 2.1: *Serie delle anomalie di temperatura media globale sulla terraferma e in Italia, rispetto ai valori climatologici normali 1961-1990. Fonti: NCDC/NOAA e ISPRA. Elaborazione: ISPRA.*

Eventi di Pioggia intensa aumentati !



Fonte: Ispra: http://www.scia.isprambiente.it/Documentazione/RAPPORTOCLIMA2014.pdf

1) Futuro? Scenari di temperatura (font: Ispra)

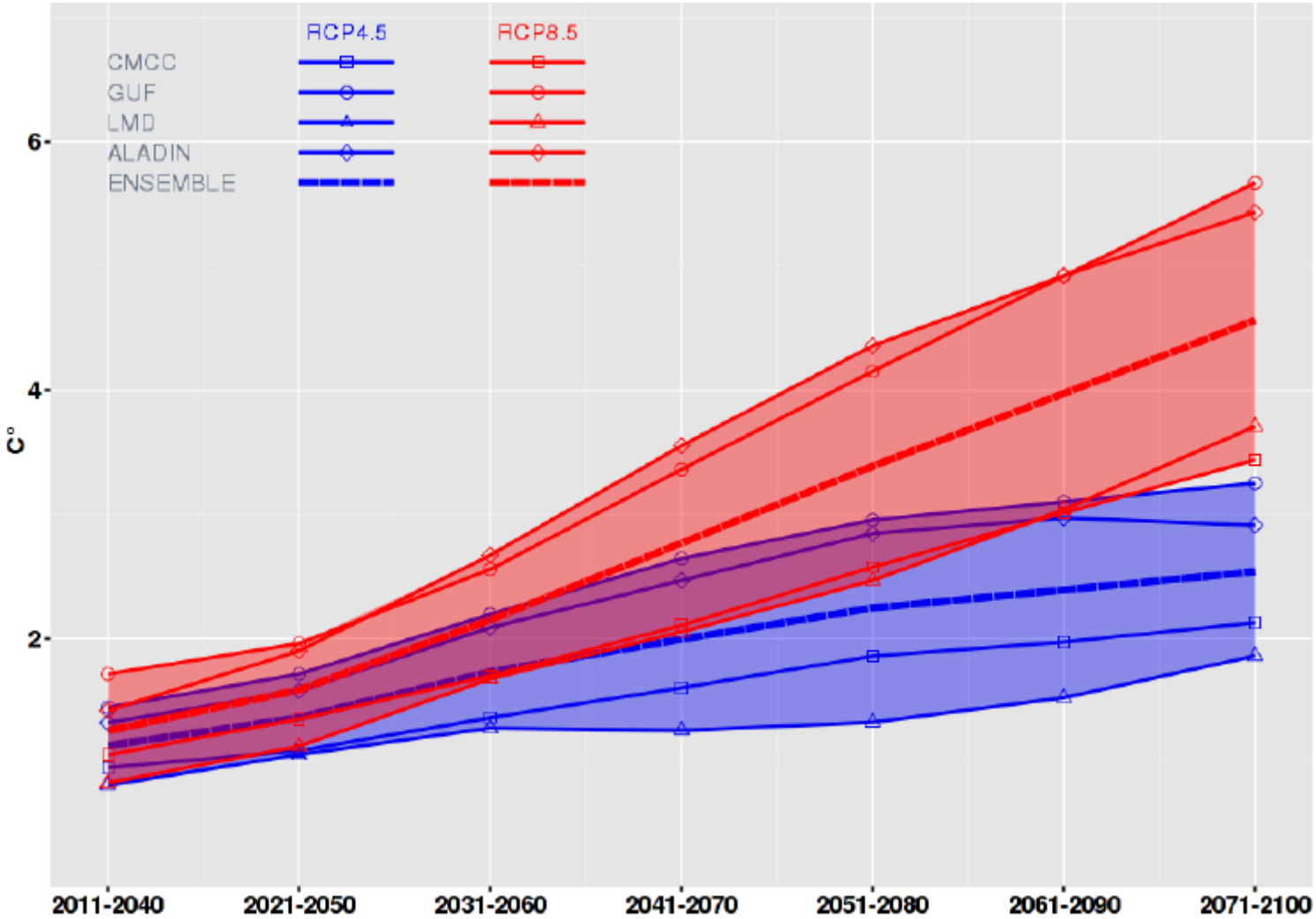


Figura 3.1 – *Temperatura massima. Variazioni rispetto alla media 1971-2000 dei valori previsti dai quattro modelli (media su periodi di 30 anni) nei due scenari RCP4.5 (blu) e RCP8.5 (rosso). L'area colorata rappresenta lo spread delle previsioni dei modelli mentre la linea tratteggiata indica la media delle variazioni previste dai modelli (ensemble mean).*

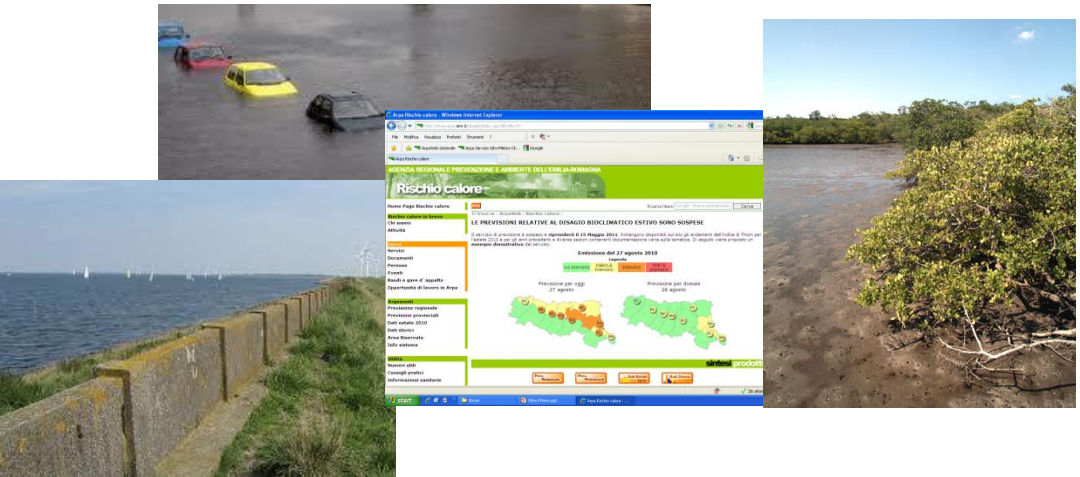
Il clima cambiato fa crescere le condizioni di pericolosità e, quindi, anche di rischio?

Risposta: SI

Servono quindi azioni di Adattamento:

PRIMES è UNA AZIONE DI ADATTAMENTO !!

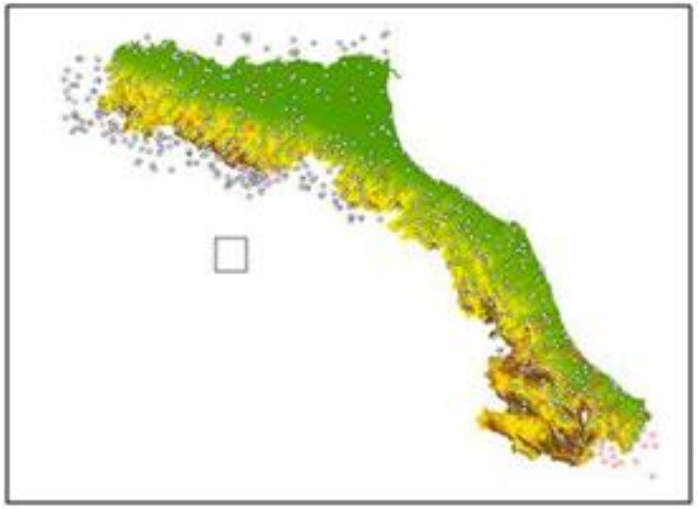
Perchè i sistemi ottimali di EWS permettono di ridurre la perdita di vite umane e ridurre i danni derivanti dagli impatti negativi dei CC in maniera anche molto efficace dal punto di vista economico , dal momento che i costi di ottimizzazione di tali sistemi sono trascurabili rispetto ai benefici che producono (riduzione dei danni)



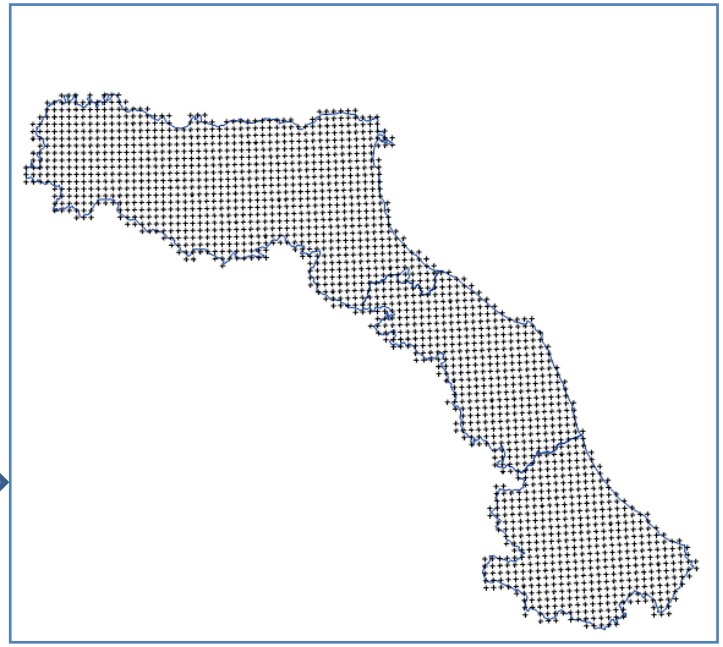
Report A: Common Data set

1.Precipitation

Daily precipitation data have been interpolated over the whole PRIMES domain using the Shepard scheme with the distances between stations computed using the topographic distance as in Antolini et al (2015).

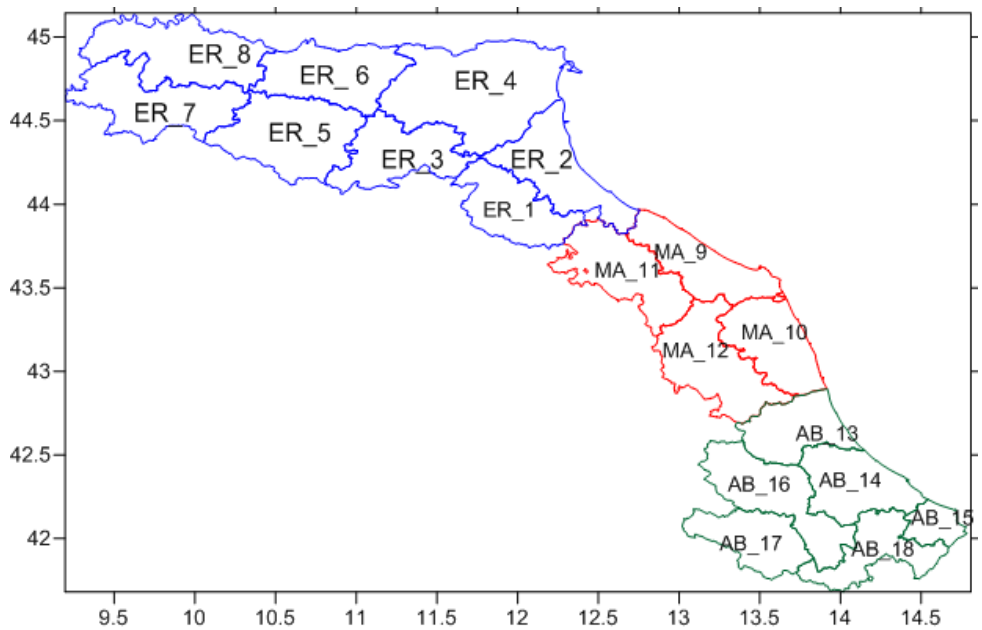


analysis at 5 Km
over 1961-2015

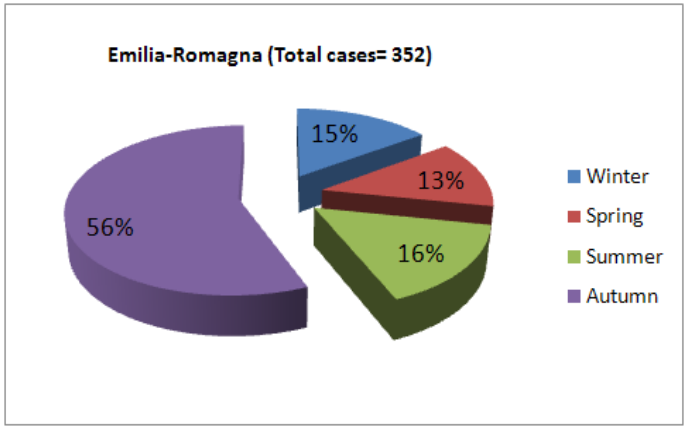


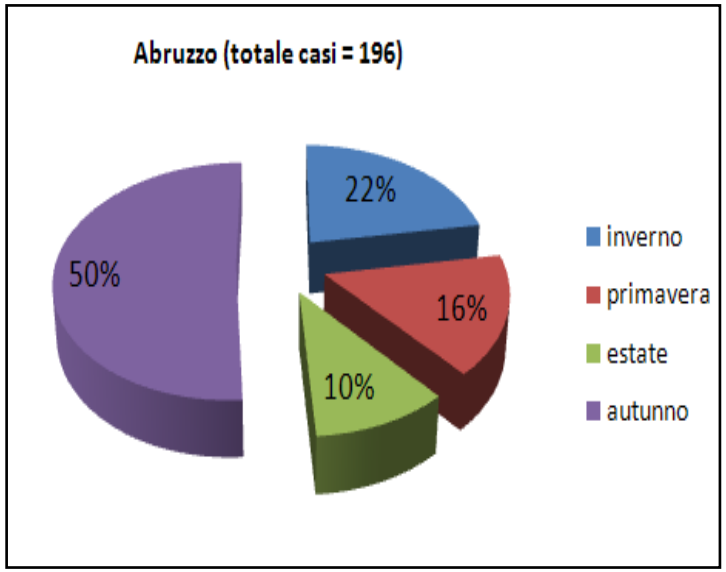
Areal Index Precipitation (AIP)

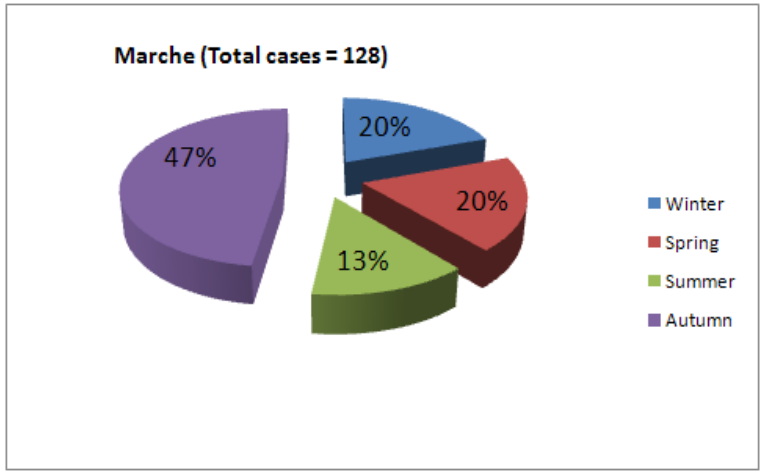
- AIP= *the number of days* in which the areal average precipitation exceeds 50 mm in 24 hours. In Emilia-Romagna region this quantity of precipitation corresponds to an events with around 2-years return period.
- The index is computed at monthly, seasonal and annual level and results are described below. The period take into analysis is from 01/01/1961 to 31/12/2015.



Seasonal distribution of AIP frequency, computed over 1961-2015 period (region level)



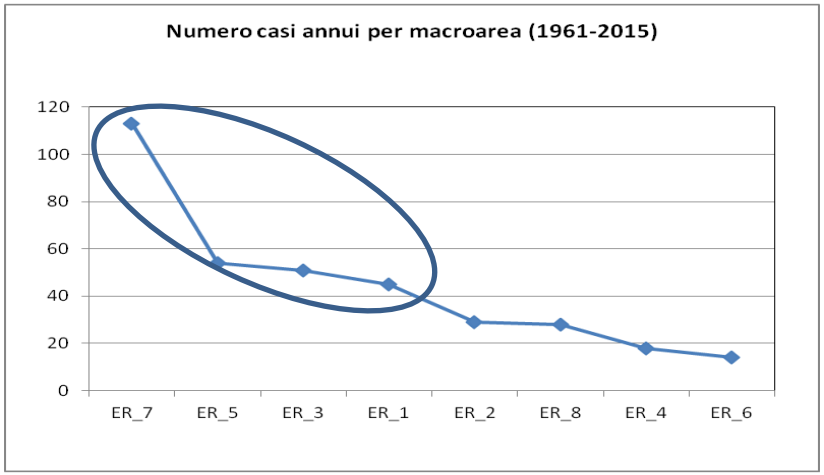




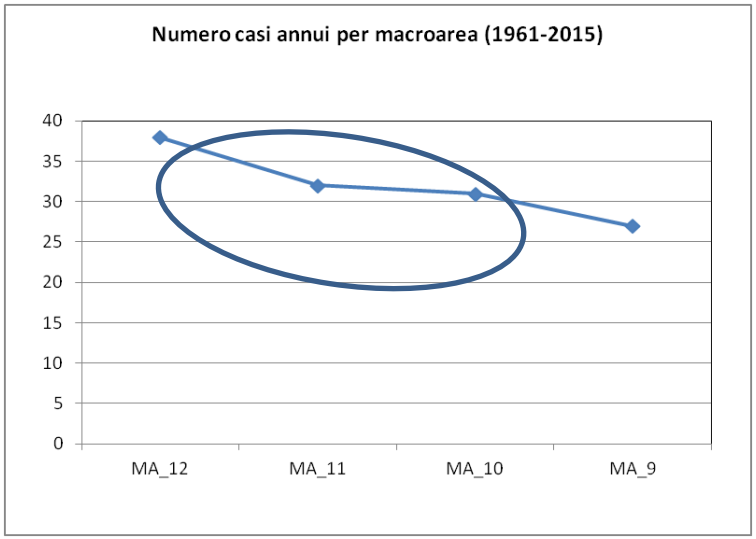
- Great part of cases during autumn

Annual distribution of the number of cases of AIP for each region

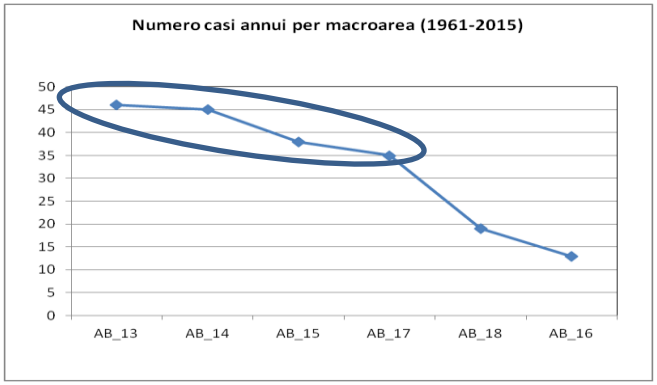
ER

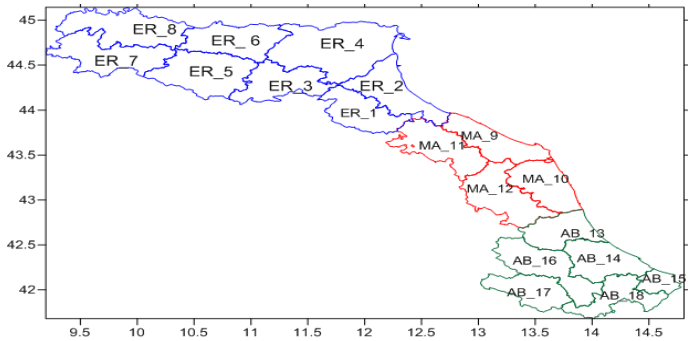


MA



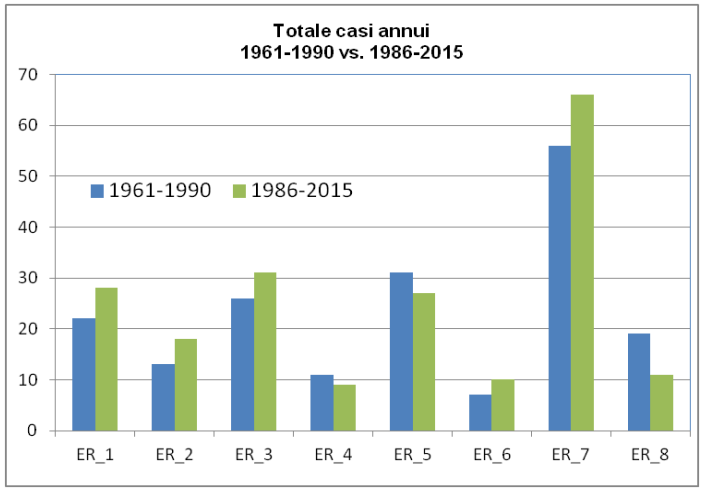
AB



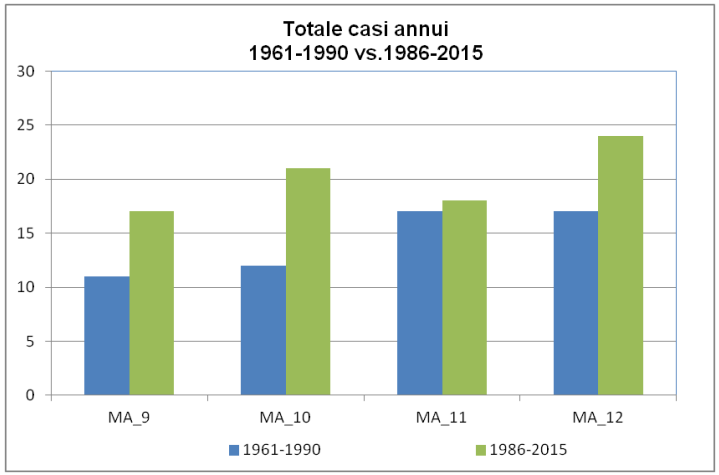


Changes in AIP 1961-1990 &1986-2015

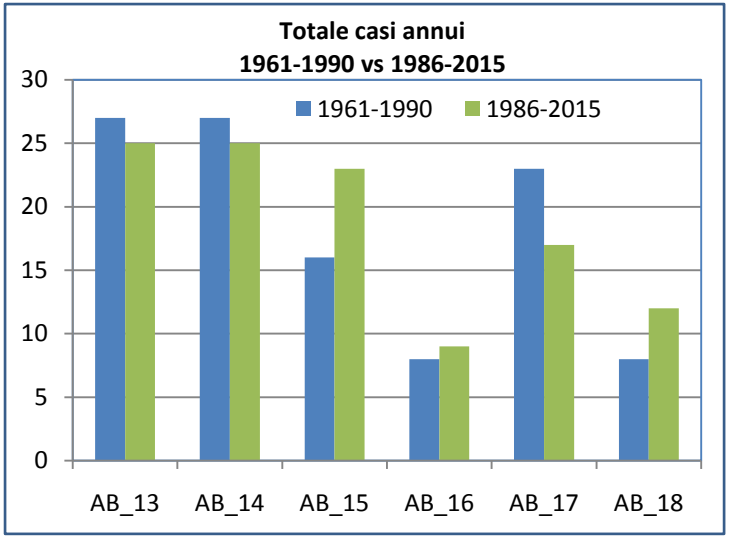
ER

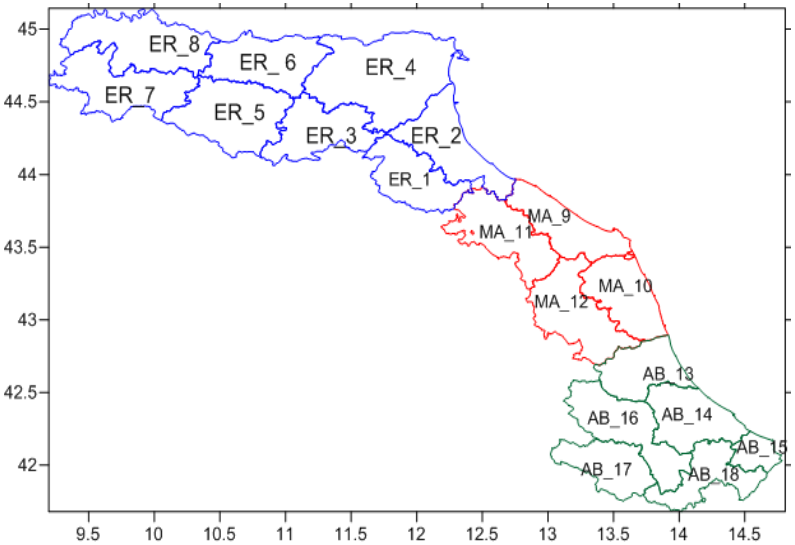


MA



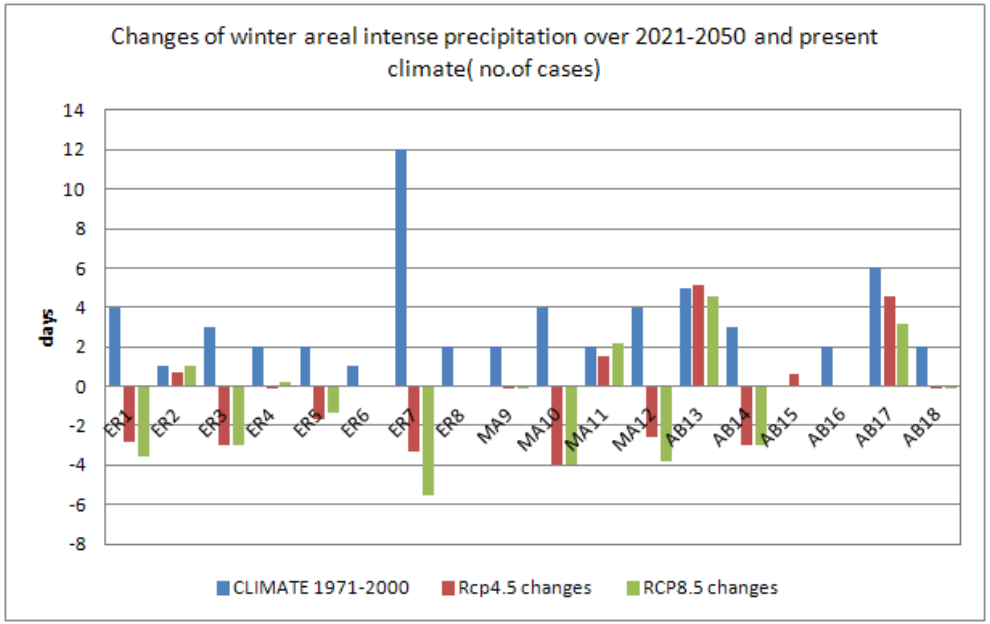
AB

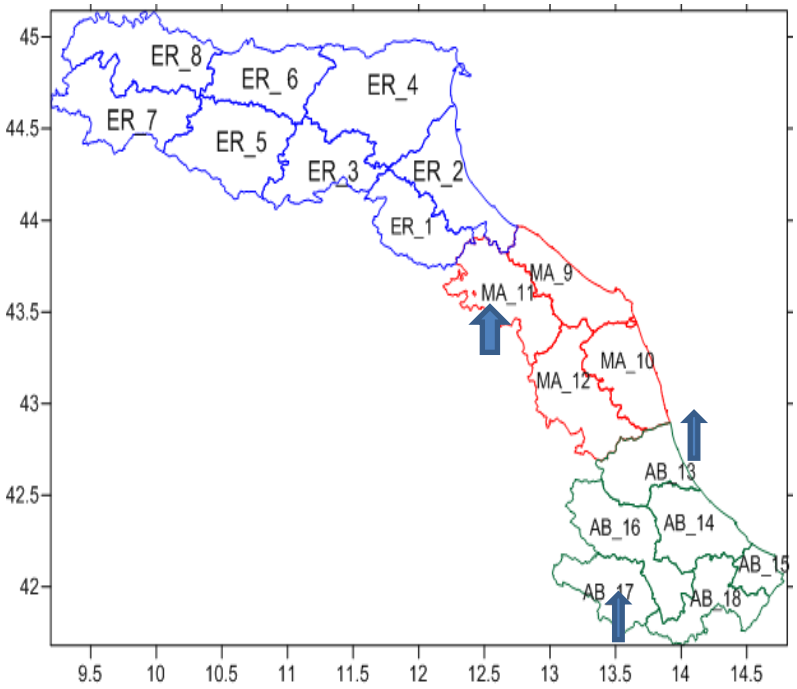




Frequency of Areal Intense Precipitation (AIP) 2021-2050 v.s.1971-2000, RCP 4.5 and RCP8.5

WINTER

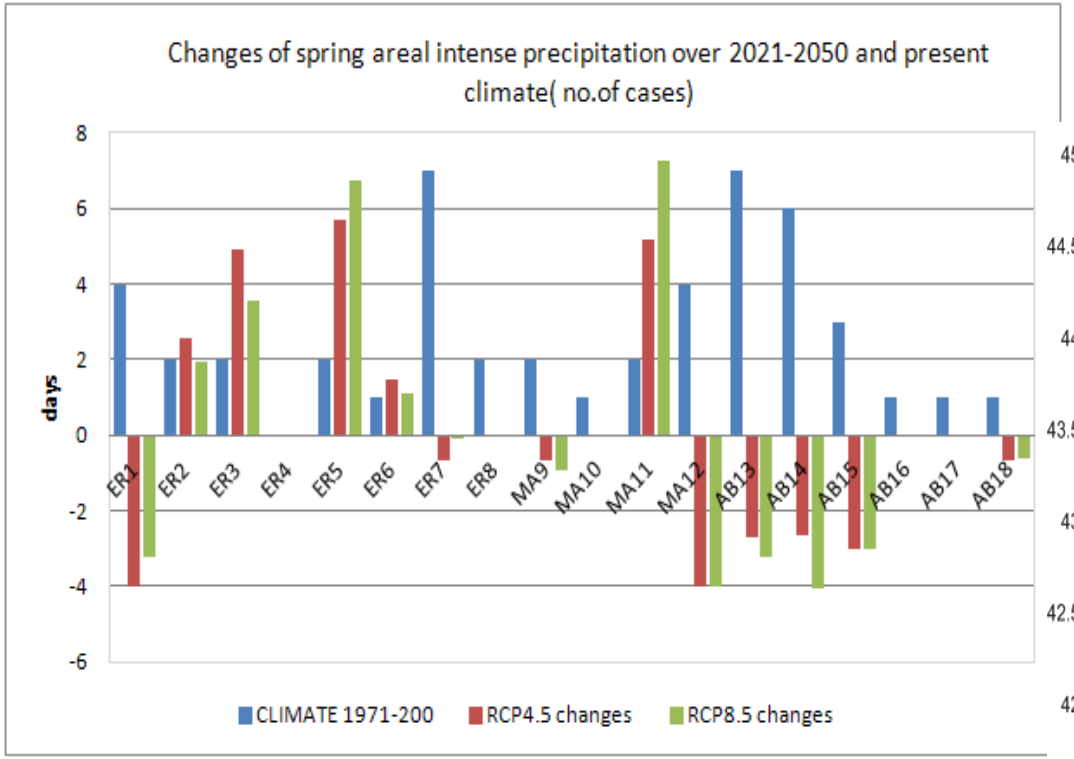


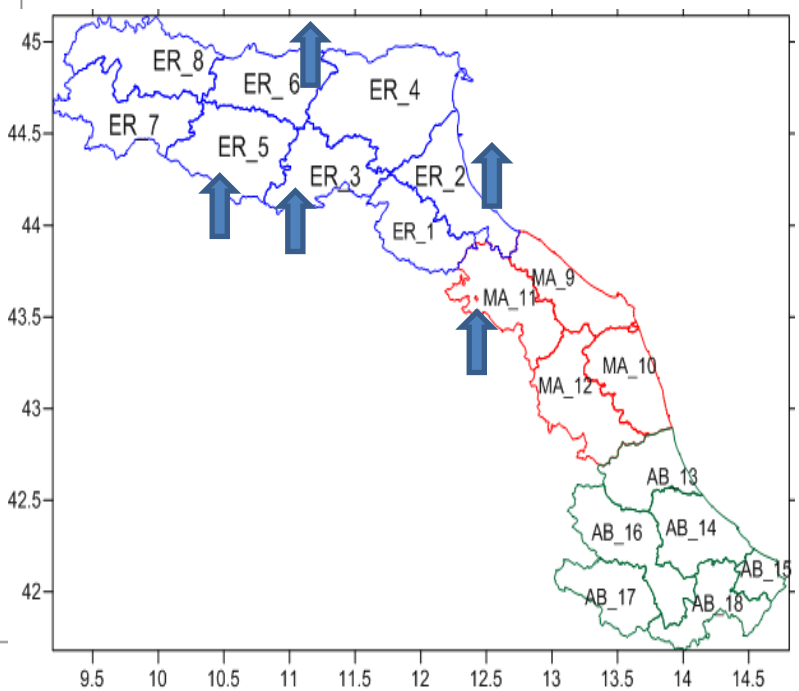


increase

decrease

SPRING

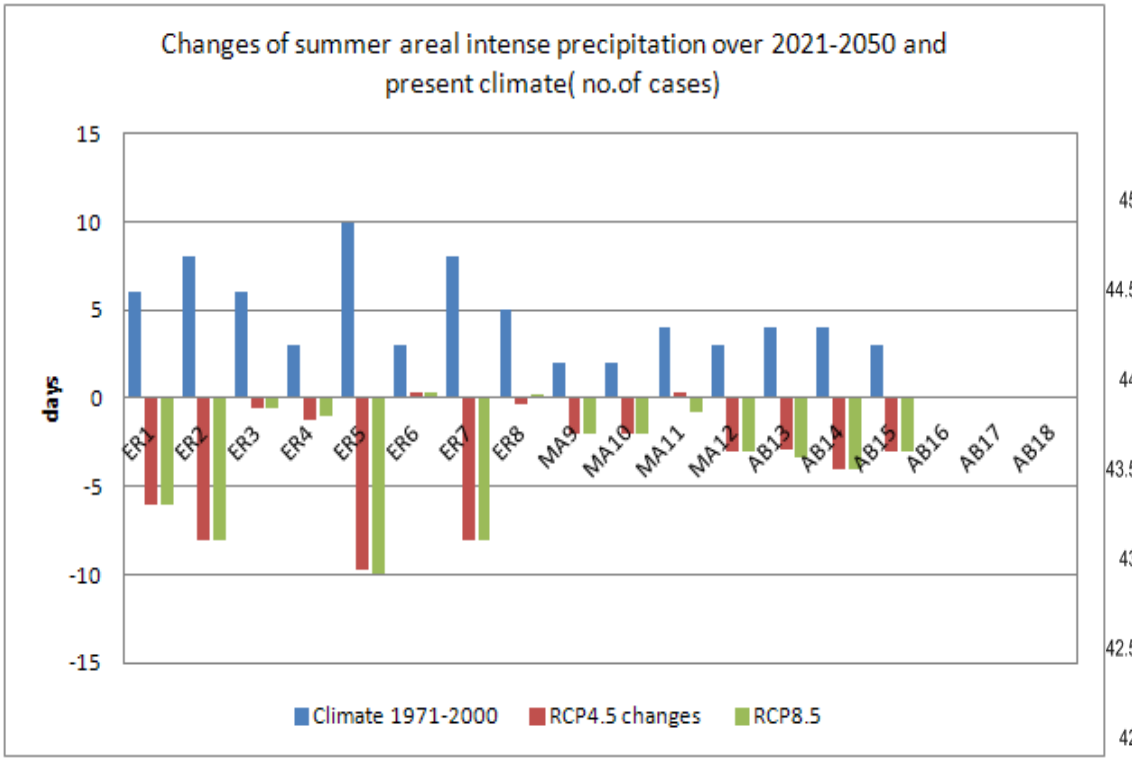


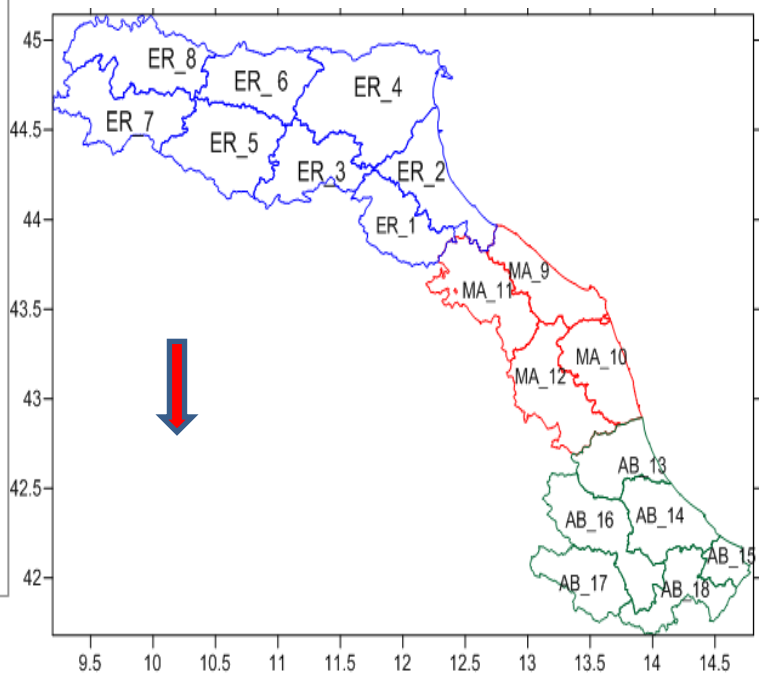


increase

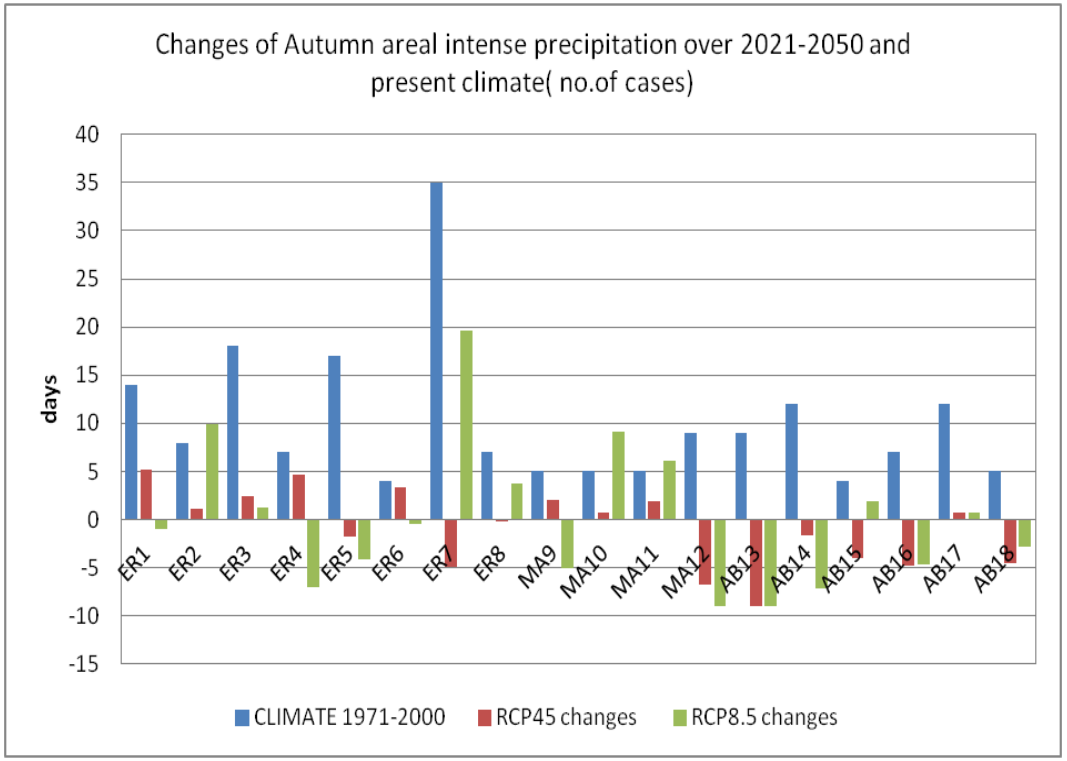
decrease

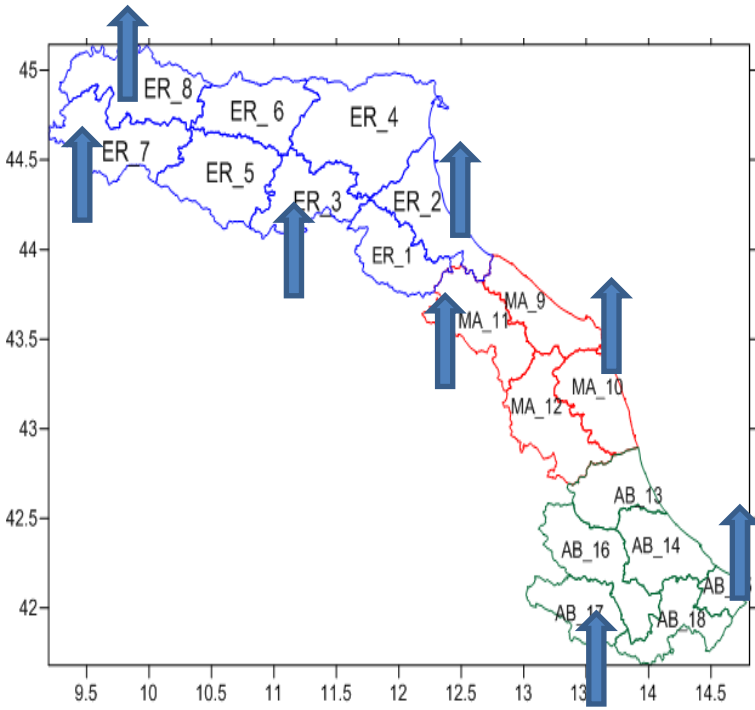
SUMMER


Changes of summer areal intense precipitation over 2021-2050 and present climate(no.of cases)
days
15
10
5
0
-5
-10
-15
ER1
ER2
ER3
ER4
ER5
ER6
ER7
ER8
MA9
MA10
MA11
MA12
AB13
AB14
AB15
AB16
AB17
AB18
Climate 1971-2000
RCP4.5 changes
RCP8.5


ER_8
ER_6
ER_4
ER_7
ER_5
ER_3
ER_2
ER_1
MA_9
MA_11
MA_10
MA_12
AB_13
AB_16
AB_14
AB_15
AB_17
AB_18
45
44.5
44
43.5
43
42.5
42
9.5
10
10.5
11
11.5
12
12.5
13
13.5
14
14.5

AUTUMN





increase

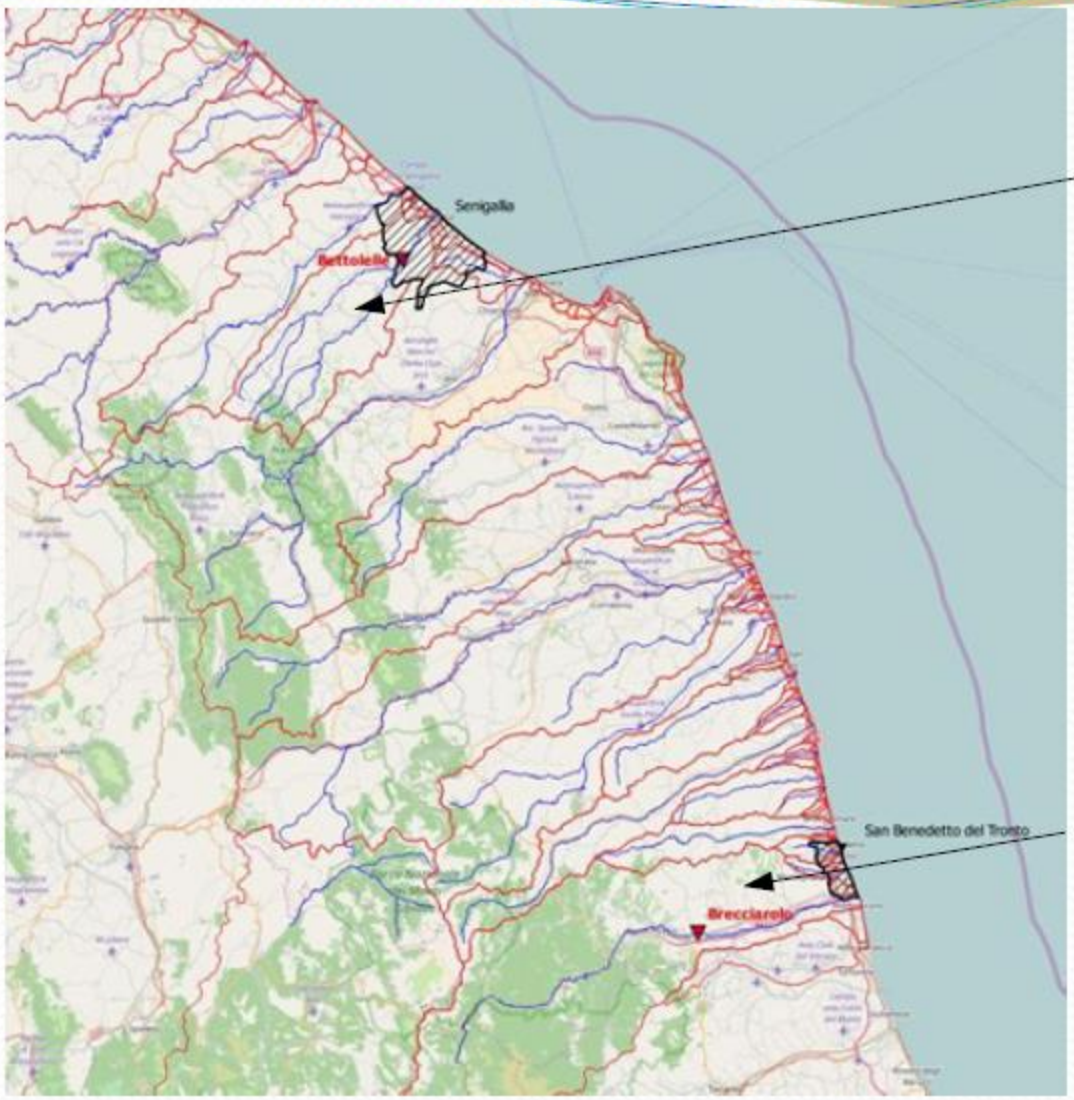
decrease

Emilia-Romagna case studies and dataset

Reno river

Santerno river

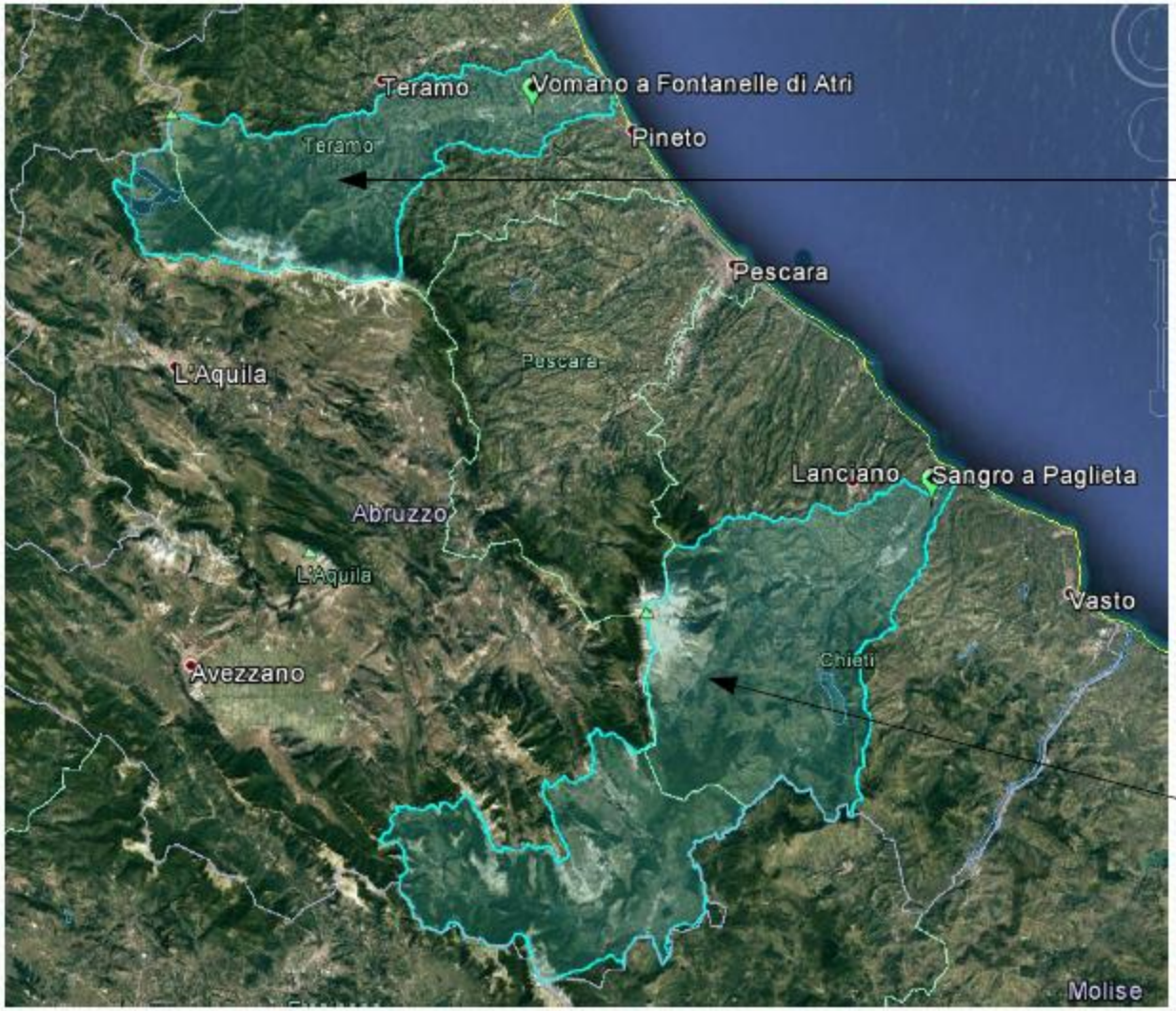
Marche case studies and dataset



Misa river

Tronto river

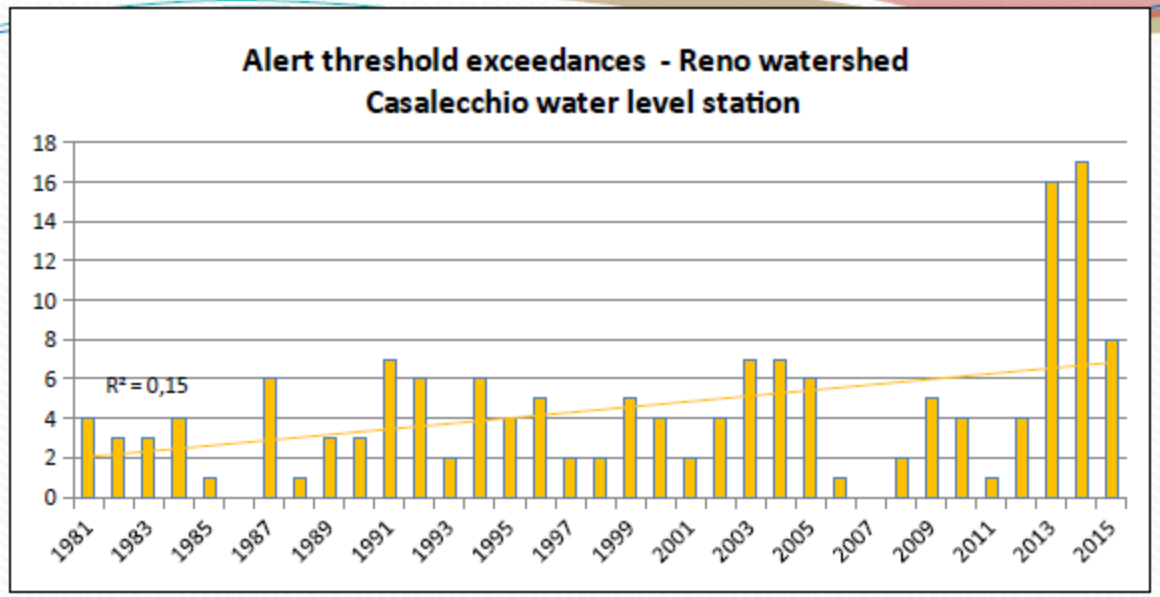
Abruzzo case studies and dataset

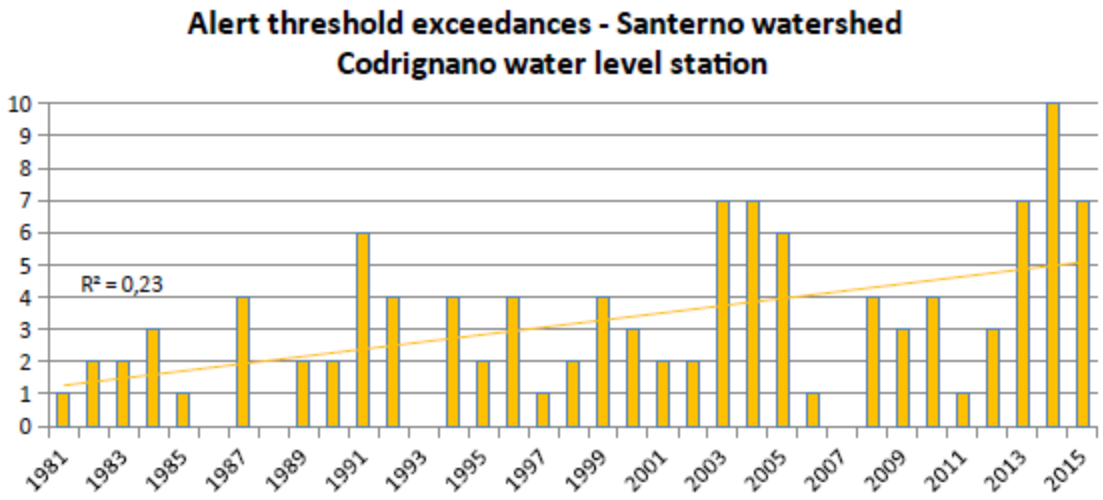


Vomano river

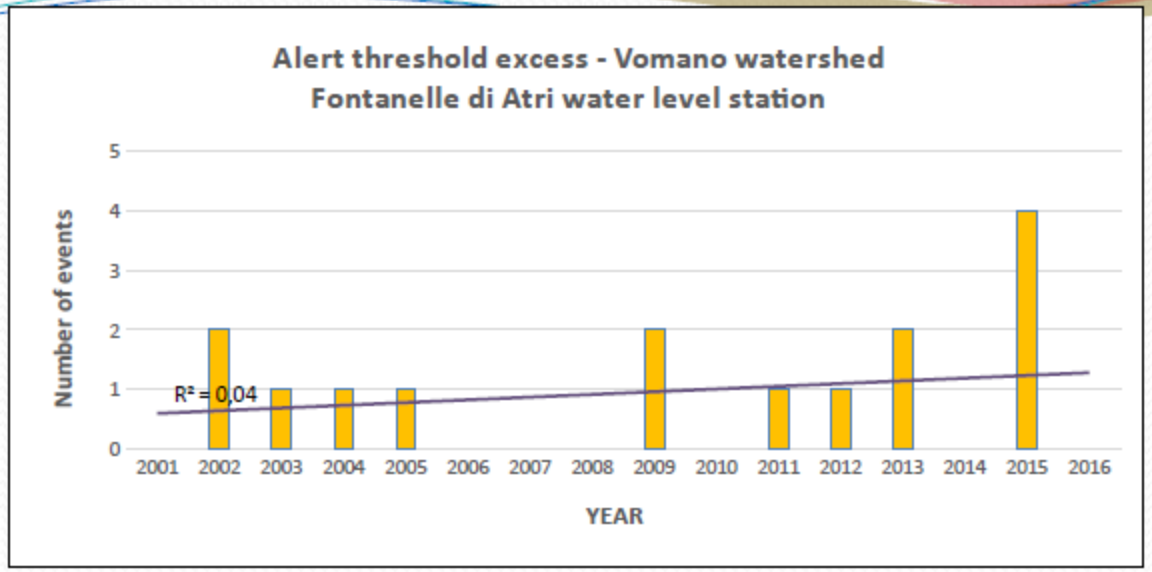
Sangro river

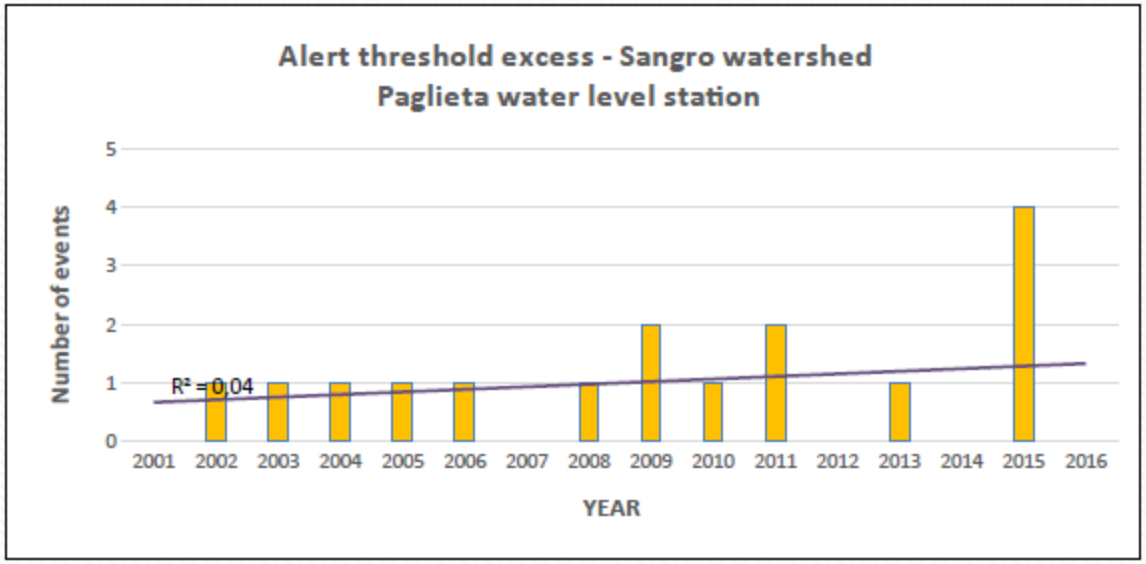
Emilia-Romagna yearly results



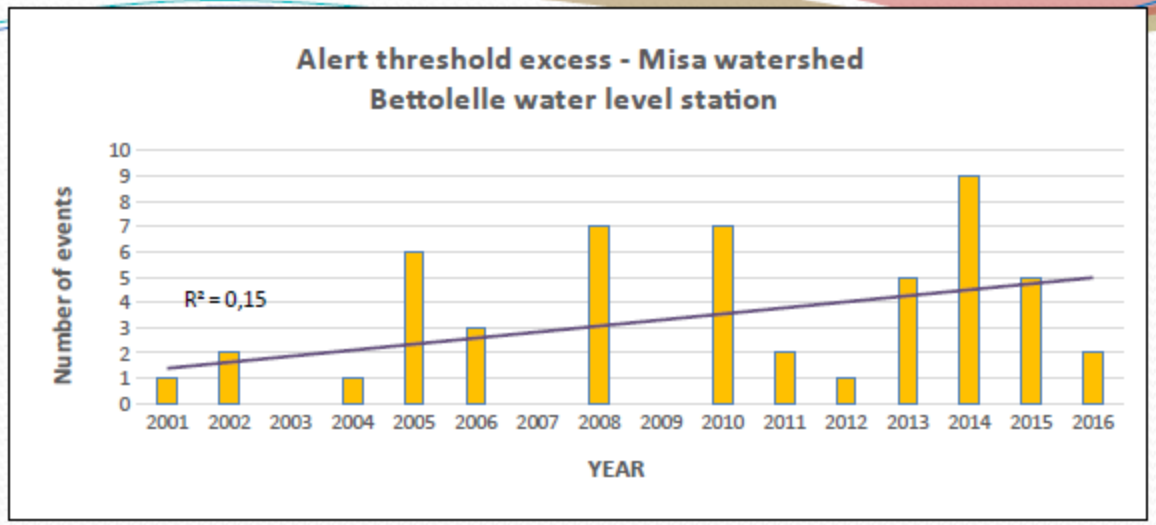


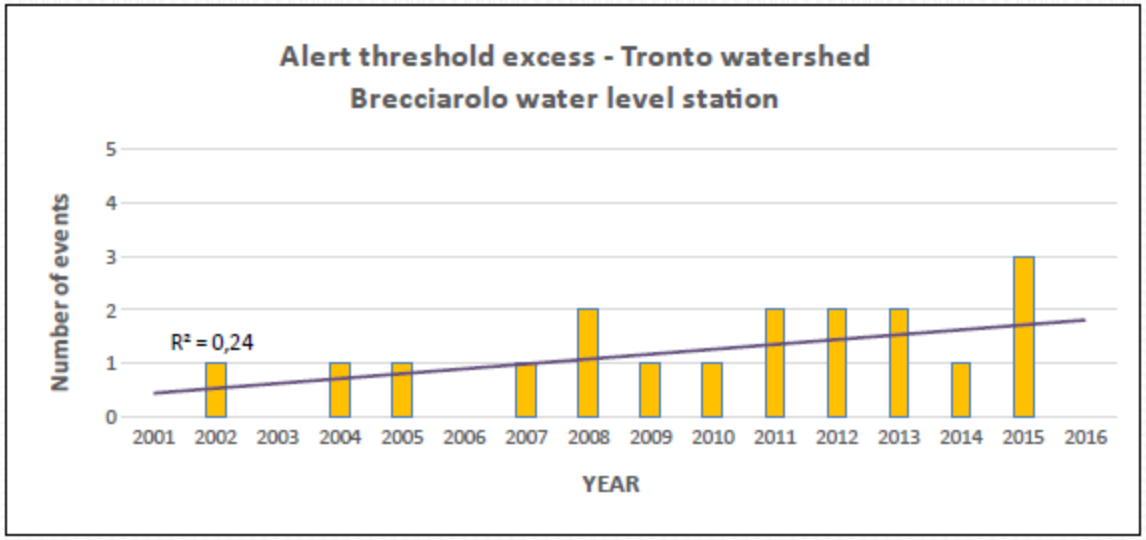
Marche yearly results





Abruzzo yearly results



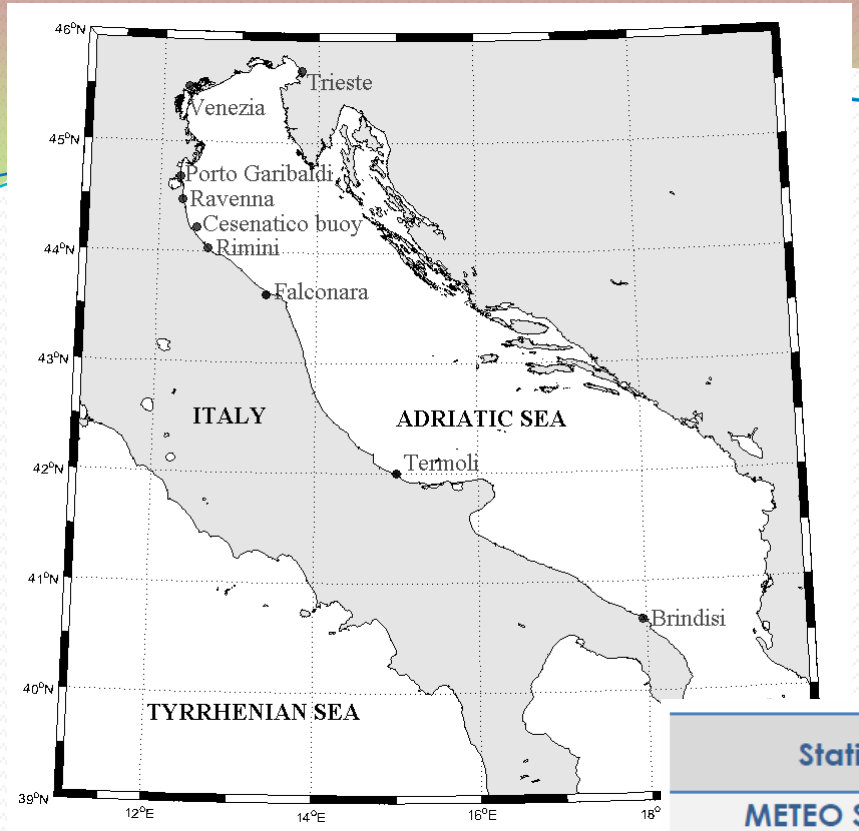


CONCLUSIONS

Analysing the number of floods occurred in the case studies basins, 2 for each regions, different in area, it seems evident that the **number of events are increasing in time**, especially in the last five years and in the Emilia-Romagna region (about twice), both for small and largest basins.

The year distribution events instead confirm thet in the last years the **major number of floods are concentrated in Autumn and Springs, in line with the climatologic behaviour.**

Used Dataset



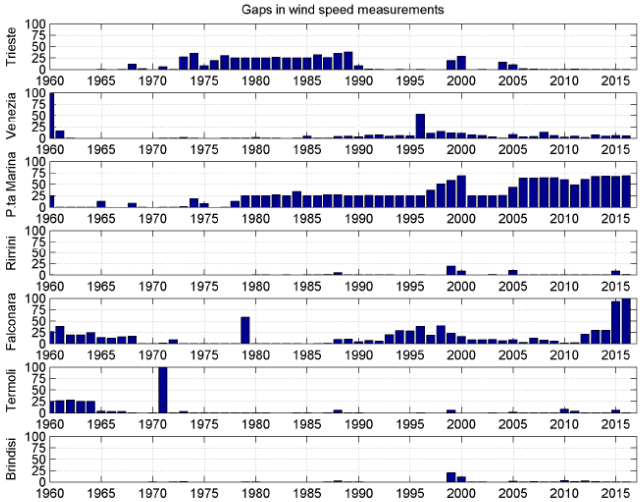
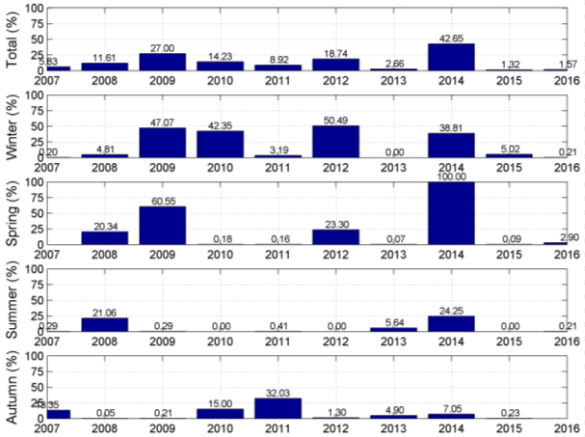


Figure 1.3. Percentage of wind speed missing data in the meteo time series.



Station	Latitude N	Longitude E	Water depth (m)	Period of observation
METEO SYNOP				
Trieste	45° 39'	13° 47'	-	1960-2016
Venezia	45° 30'	12° 20'	-	1961-2016
Punta Marina (RA)	44° 28'	12° 17'	-	1960-2016
Rimini	44° 02'	12° 37'	-	1960-2016
Falconara (AN)	43° 37'	13° 22'	-	1960-2016
Termoli	42° 00'	15° 00'	-	1960-2016
Brindisi	40° 39'	17° 57'	-	1960-2016
TIDE GAUGE				
Porto Garibaldi (FE)	44° 40.6'	12° 15'	-	2009-2016
Porto Corsini (RA)	44° 29.5'	12° 17'	-	1998-2015
WAVE BUOY				
Cesenatico	44° 12.9'	12° 28.5'	10	2007-2016
SWAN virtual buoy	44° 19.9'	12° 24'	10	2006-2016

Table 1.1: characteristics of data measurements used in this analysis.

Wave storm analysis

Mareggiata

- Altezza significativa superiore a **1.5 m**
- Due eventi sono separati se l'altezza significativa rimane inferiore a 1,5 m per almeno **12 ore** (Boccotti, 1997)

L'altezza significativa viene integrata nel tempo, in questo modo possiamo classificare le mareggiate in base al suo **contenuto energetico** che è in grado di trasferire al sistema costa. (Mendoza & Jiménez, 2004)

CLASS	Energy Density [m^2hr]
I weak	$E^* <= 58.4$
II moderate	$58.4 < E^* <= 127.9$
III significant	$127.9 < E^* <= 389.7$
IV intense	$389.7 < E^* <= 706.9$
V very intense	$E^* > 706.9$

SWH and Sea Level during wave storms