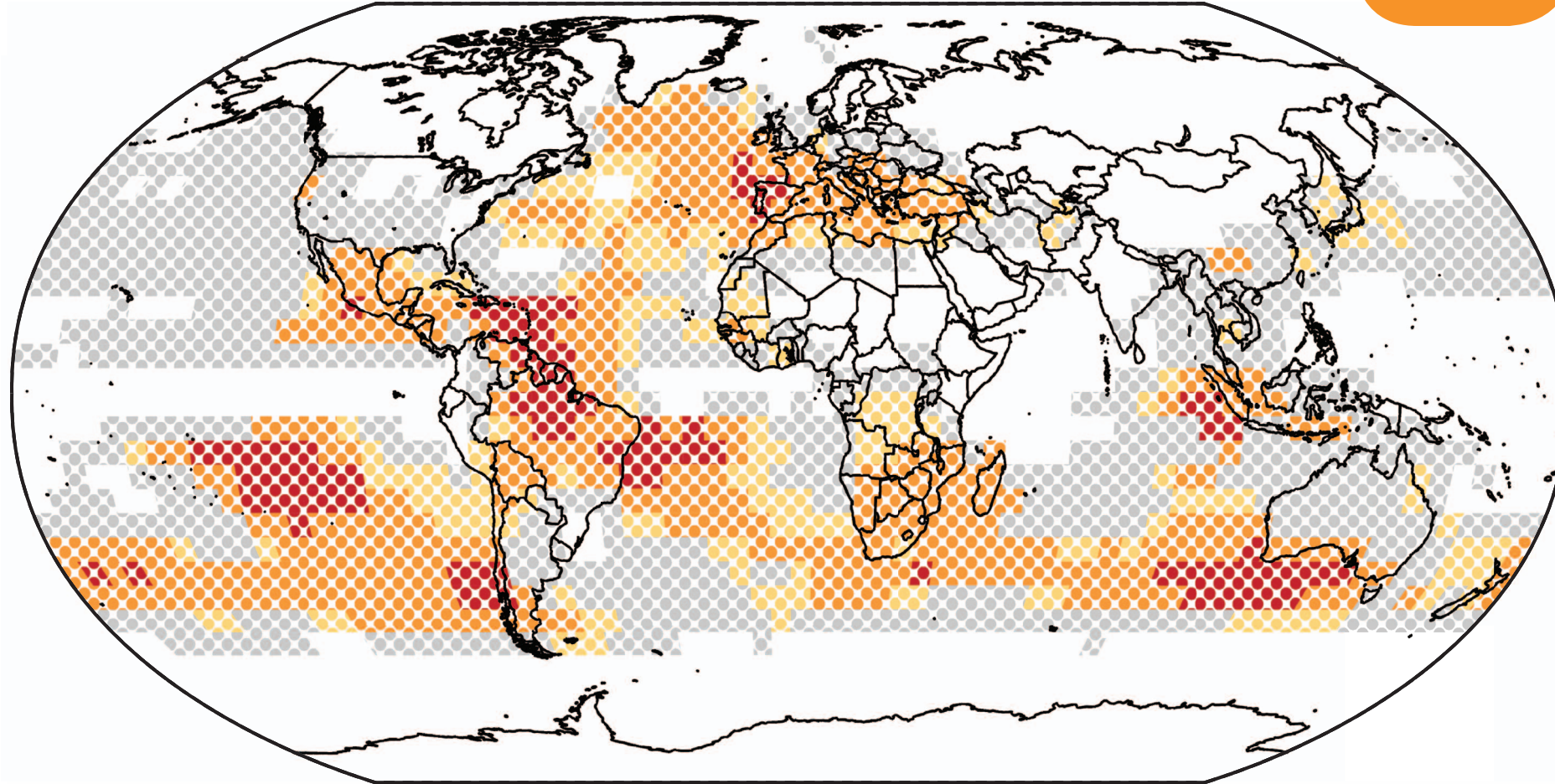


## Decrease in the mean number of wet days per year

Wet days are defined as days with at least 1 mm of precipitation.



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### Background information

A Climate-Signal-Map shows the mean projected change of a climate parameter averaged for the time period of 2036 to 2065 compared to the average for the time period of 1971 to 2000.

The map is based on a set of 66 climate change projections from a multitude of recent global climate models, resampled on a regular 5° x 5° grid. It combines simulations following three different emission scenarios.

Projected changes are regarded as robust, if at least 2/3 of all models project changes that are:

- in the same direction (decrease/increase), and
- statistically significant, and
- insensitive to small shifts of the reference and scenario time periods.

All areas with robust climate change signals are highlighted with color. All areas with non-robust changes are marked with grey.

White areas depict regions with a change in the opposite direction than indicated in the map.

More details on the method can be found under [www.climate-service-center.de/climate-signal-maps](http://www.climate-service-center.de/climate-signal-maps)

### Legend

- Decrease** in number of wet days:
- more than 10 days/year .....
  - between 5 and 10 days/year .....
  - less than 5 days/year .....
  - projected decrease not robust .....
- Increase** in number of wet days .....

On behalf of



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Eine Einrichtung des Helmholtz-Zentrums Geesthacht

### Zusammenfassung

#### Climate-Signal-Maps

- können strategischen Portfolioideen dienen.
- sind ein Tool zur schnellen und leicht verständlichen Überprüfung der Robustheit der verfügbaren Klimaänderungsinformationen.
- dienen zur Sensibilisierung im Umgang mit Klimainformationen.
- basieren auf state-of-the-art Klimainformationen und wissenschaftlichen Analysen.
- bieten als Ergänzung zu den Climate-Fact-Sheets auch regional aufgegliederte Informationen.
- können auch für weitere Klimaparameter erzeugt werden.

### Was hinter den Climate-Signal-Maps steckt

#### Climate-Signal-Maps

- basieren auf 66 verschiedenen Klimaprojektionen aktueller globaler Klimamodelle (IPCC AR5) für 3 verschiedene Emissionsszenarien (RCP 2.6; RCP 4.5 und RCP8.5) mit der Periode 2036 bis 2065 als Projektions- und der Periode 1971 bis 2000 als Referenzzeitraum.
- sind für verschiedene Klimaparameter und Indikatoren verfügbar.
- haben (in den meisten Fällen) eine Richtung und zeigen die projizierte Zu-/ oder Abnahme eines Parameters, basierend auf dem damit verbundenen Gefährdungspotential.
- zeigen die Größe der projizierten Änderungen nur dann, wenn die Änderungen auch **robust** sind.

#### Robustheitstests:

Es werden für alle Klimaprojektionen drei verschiedene Robustheitsabfragen durchgeführt. Nur wenn mindestens 2/3 aller Klimaprojektionen den jeweiligen Test bestehen, werden die Änderungen farblich in der Karte dargestellt.

#### Test 1 – Übereinstimmung der Richtung der simulierten Änderungen

Basiert auf der "likely"- Annahme des IPCC AR4 (und auch AR5) und den Climate-Fact-Sheets.

#### Test 2 – Statistische Signifikanz der simulierten Änderungen

Dient der Unterscheidung zwischen Signal und Rauschen. Ein parameterfreier, verteilungsunabhängiger Signifikanztest wird verwendet.

#### Test 3 – Sensitivität gegenüber kleinen zeitlichen Änderungen

Hier wird der Einfluss von dekadischen Schwankungen auf das Klimaänderungssignal untersucht. Insgesamt wird die Referenz- und die Klimaänderungsperiode 10 mal um jeweils 1 Jahr verschoben und dann getestet, ob sich die Mittelwerte der projizierten Änderungen unterscheiden.

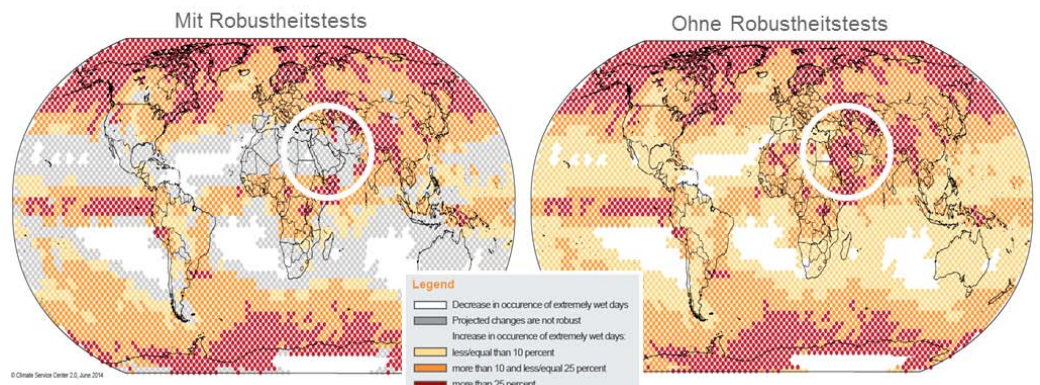
... 2035-2064 vs 1970-1999 ← 2036-2065 vs 1971-2000 → 2037-2066 vs 1972-2001 ...

### Mehrwert der Climate-Signal-Maps

Climate-Signal-Maps zeigen auf einen Blick

- für welche Regionen basierend auf heutigem Wissen robuste ("verlässlichere") Klimaänderungsinformationen zur Verfügung stehen
- in welchen Regionen die projizierten robusten Änderungen am stärksten sind

Beispiel: Projizierte Änderungen im Auftreten von Tagen mit sehr starkem Niederschlag



### What is shown in the maps?

- The maps show the possible decrease in the number of wet days under future climate conditions (averaged for the time period of 2036 to 2065 compared to the average of the time period from 1971 to 2000).
- White regions indicate an increase in the frequency of wet days.
- Grey regions indicate where the projected decrease in the frequency of wet days is not robust.

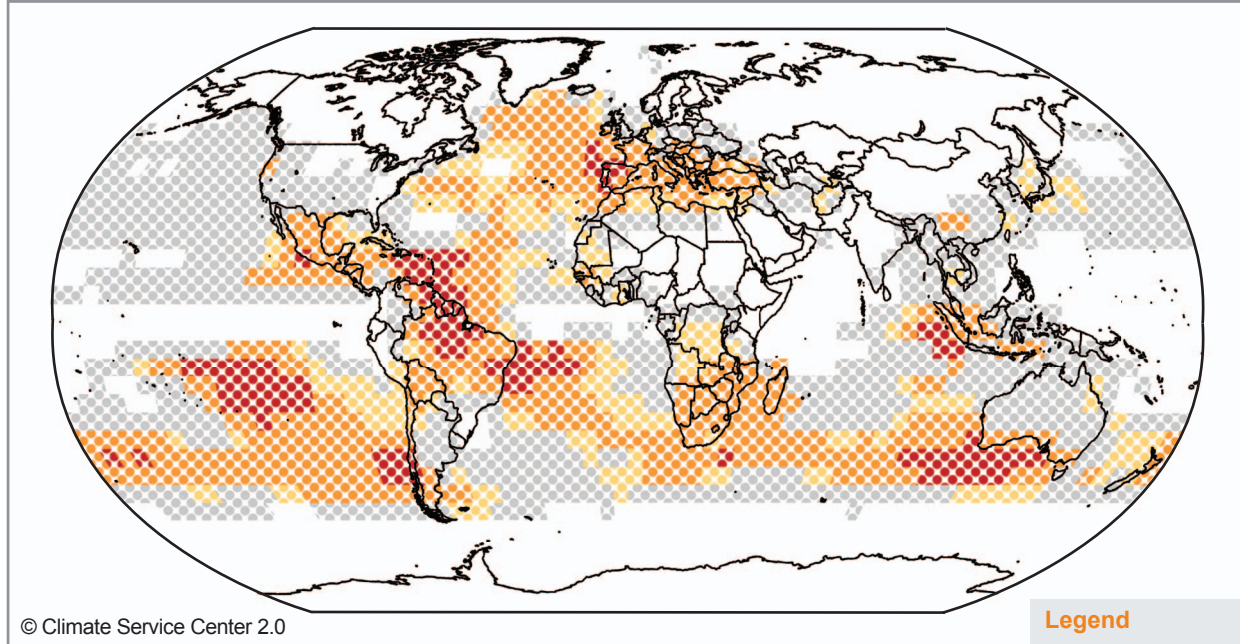
### How is a wet day defined?

- A wet day is defined as a day with at least 1mm of precipitation.
- It is a non-region specific index, which is calculated from today's precipitation statistics.






### Why is it interesting to know if wet days will occur less frequent in the future?

- The knowledge about the future frequency of wet days is important as less wet days (which at the same time means more dry days) could e. g.:
  - increase the need for the installation of irrigation facilities.
  - impact the agricultural production.
  - impact the potential of energy production from hydro systems.

### Global distribution - Decrease in the mean number of wet days per year

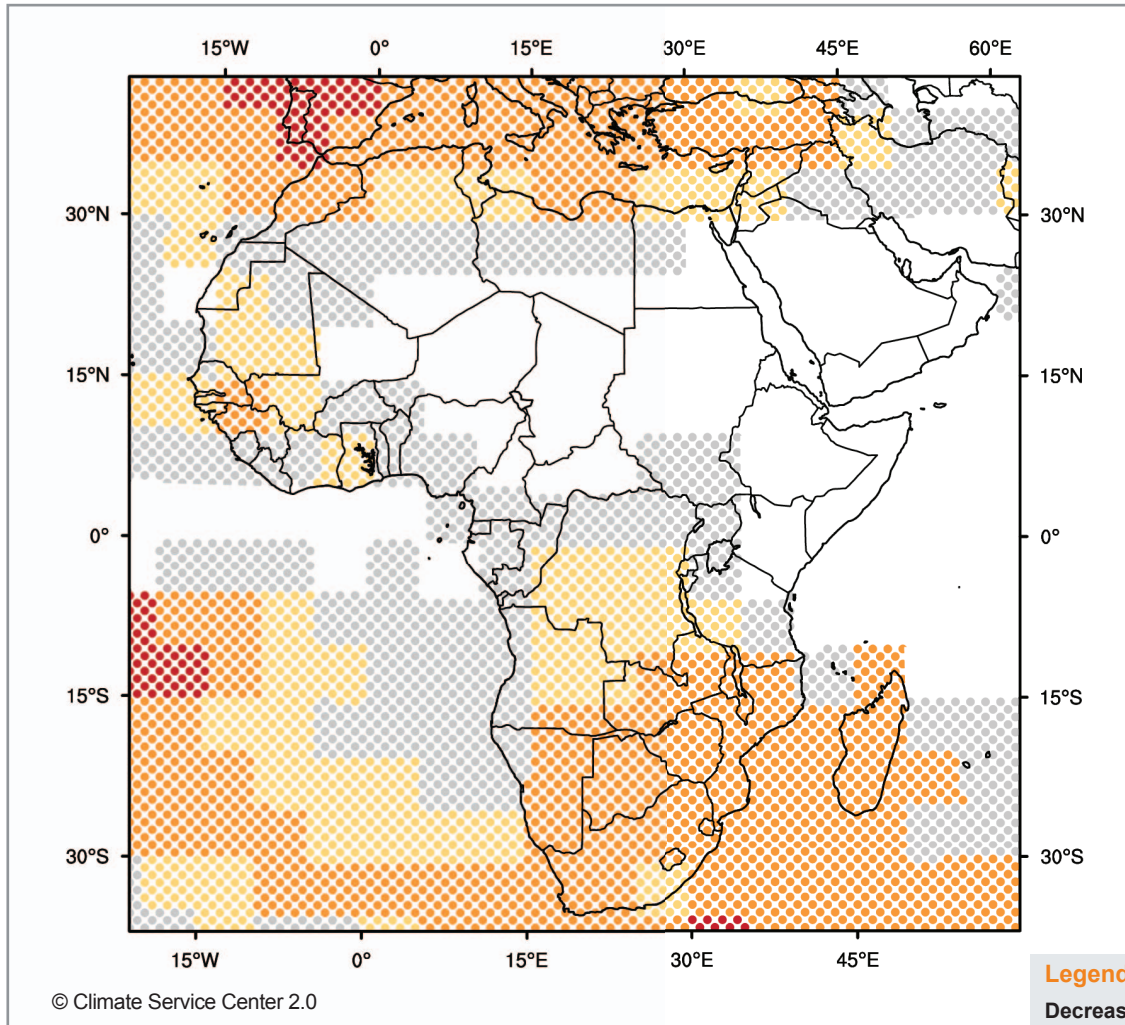


#### Legend






<b>Decrease</b> in number of wet days:	
more than 10 days/year .....	
between 5 and 10 days/year .....	
less than 5 days/year .....	
projected decrease not robust .....	
<b>Increase</b> in number of wet days .....	

### Regional distribution - Decrease in the mean number of wet days per year

#### Africa



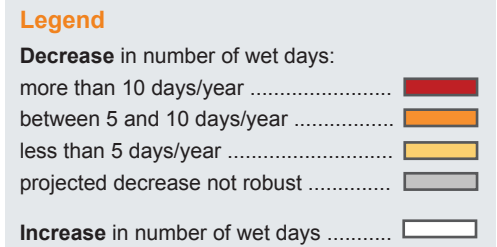
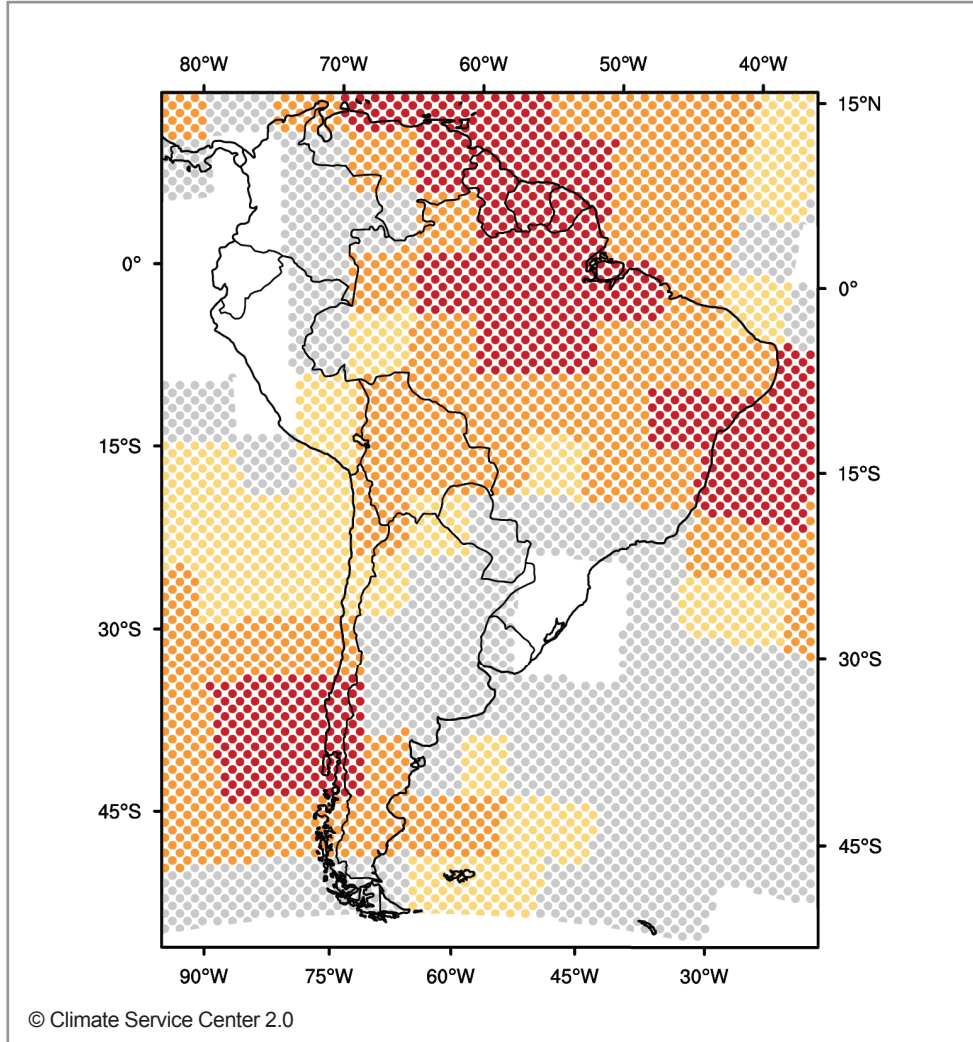
#### Legend

Decrease in number of wet days:	
more than 10 days/year .....	
between 5 and 10 days/year .....	
less than 5 days/year .....	
projected decrease not robust .....	
<b>Increase</b> in number of wet days .....	

#### Short explanation of figure

- The annual number of wet days is projected to increase for Somalia, Ethiopia, Kenya, Eritrea, northern Sudan, Central African Republic, Chad, Niger and for parts of Mali, Nigeria, Cameroon, Algeria, Libya, Egypt and Tanzania. For the remaining parts of Africa, the number of wet days is projected to decrease.
- The projected decrease is robust for South Africa, eastern Namibia, Botswana, Zimbabwe, Mozambique, Zambia, Malawi, eastern Angola, large parts of the Democratic Republic of the Congo, for Madagascar, and parts of Tanzania in the south. In north-west Africa, the decrease is robust for parts of Guinea, Guinea-Bissau, Gambia, Senegal, western Mali, southern Mauritania, Ghana, and eastern Cote d'Ivoire. Also the northern regions of Morocco, Algeria, Tunisia, Libya and Egypt show robust decreases of the number of wet days.

### Regional distribution - Decrease in the mean number of wet days per year South America

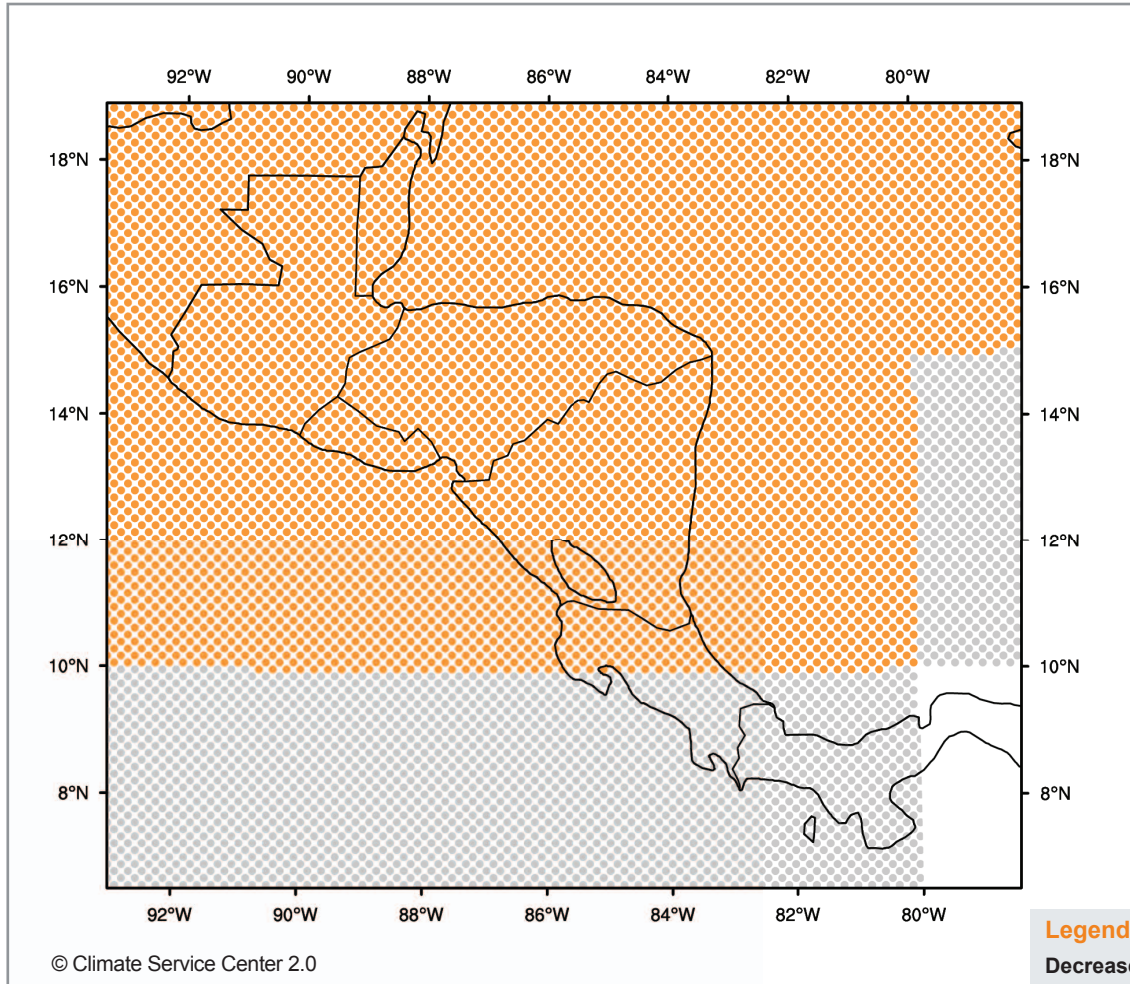


#### Short explanation of figure

- For most of South America, the annual number of wet days is projected to decrease. Only for the western parts of Columbia and Peru and Ecuador and for the southernmost part of Brazil, an increase in the number of wet days is projected.
- The projected decrease is robust for most of Brazil, for Paraguay, Chile, southern Argentina, southeastern Peru, large parts of Venezuela, and for Guyana, Surinam, and French Guyana, where the projected decrease has the highest values (> 10days/year).


### Regional distribution - Decrease in the mean number of wet days per year


## Central America




#### Legend


**Decrease** in number of wet days:

more than 10 days/year ..... 

between 5 and 10 days/year ..... 

less than 5 days/year ..... 

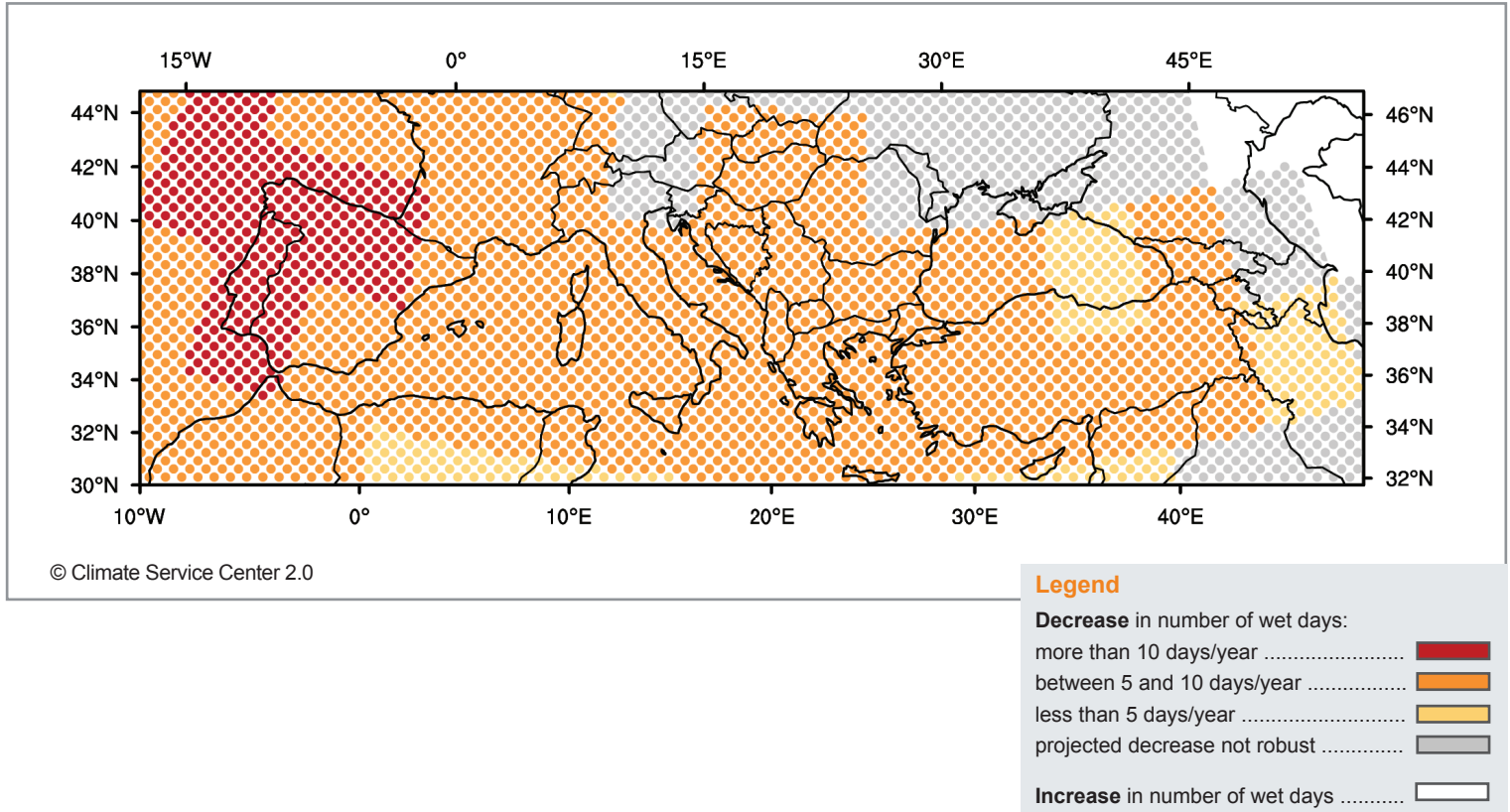
projected decrease not robust ..... 

**Increase** in number of wet days ..... 

### Short explanation of figure

- For almost the entire region of Central America, the number of wet days per year is projected to decrease.
- The projected decrease is robust for all land areas north of 10°N.
- For the entire region, moderate decreases in the number of wet days per year are projected (less than -5days/year)
- Due to the small size of the land surface, and the comparably large grid boxes of the climate models, the model results have to be treated with extra caution in this region.

### Regional distribution - Decrease in the mean number of wet days per year Southern Europe & Caucasus

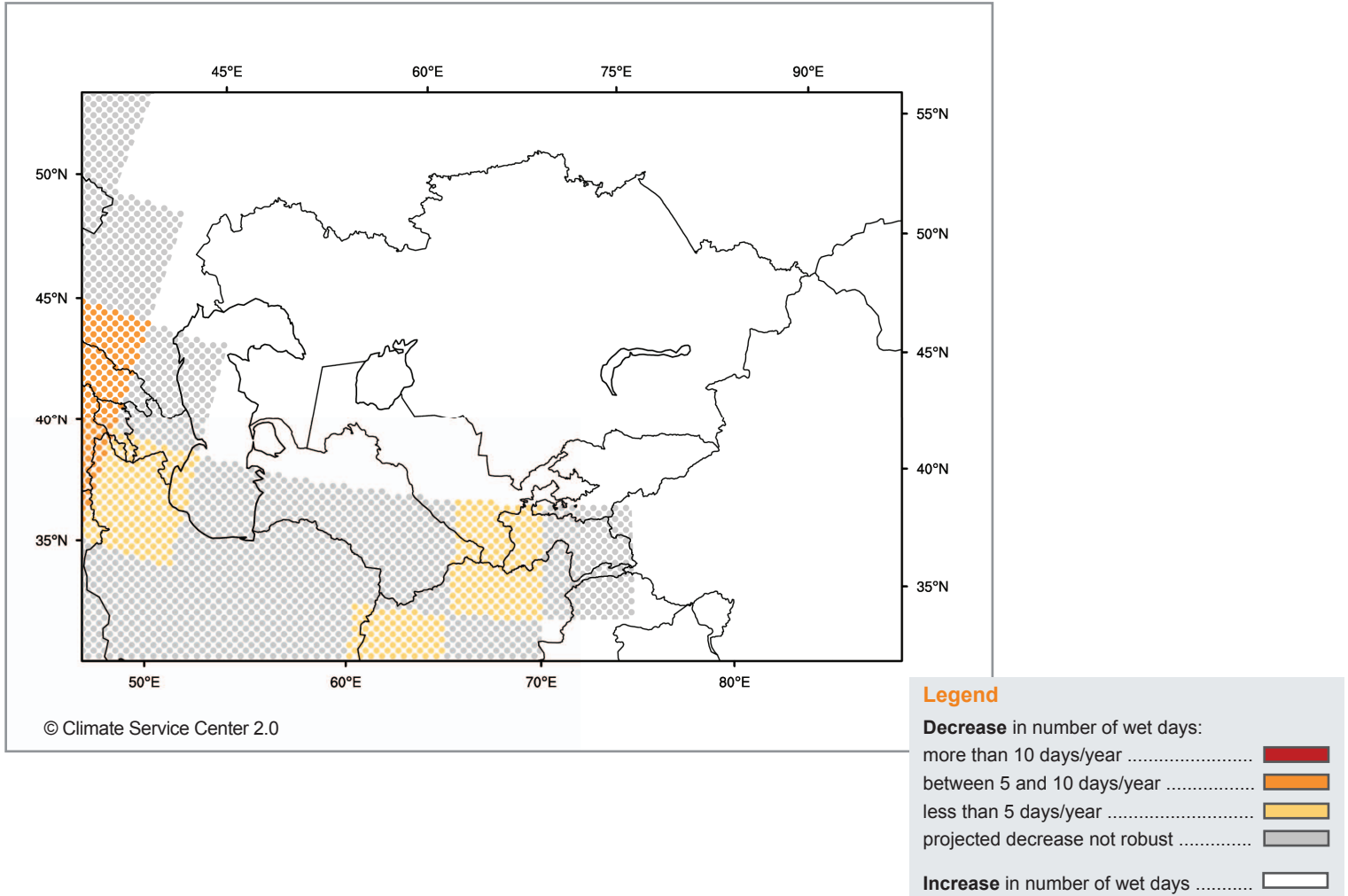


#### Short explanation of figure

- For almost the entire region of Southern Europe & Caucasus, the number of wet days per year is projected to decrease.
- The projected decrease is robust for the western and southern part of the region. Non-robust regions stretch from northern Italy to the Czech Republic and from north-eastern Romania to Russia.
- The projected decrease is strongest for Portugal and northern Spain where it reaches more than -10 days per year.

### Regional distribution - Decrease in the mean number of wet days per year

#### Central Asia



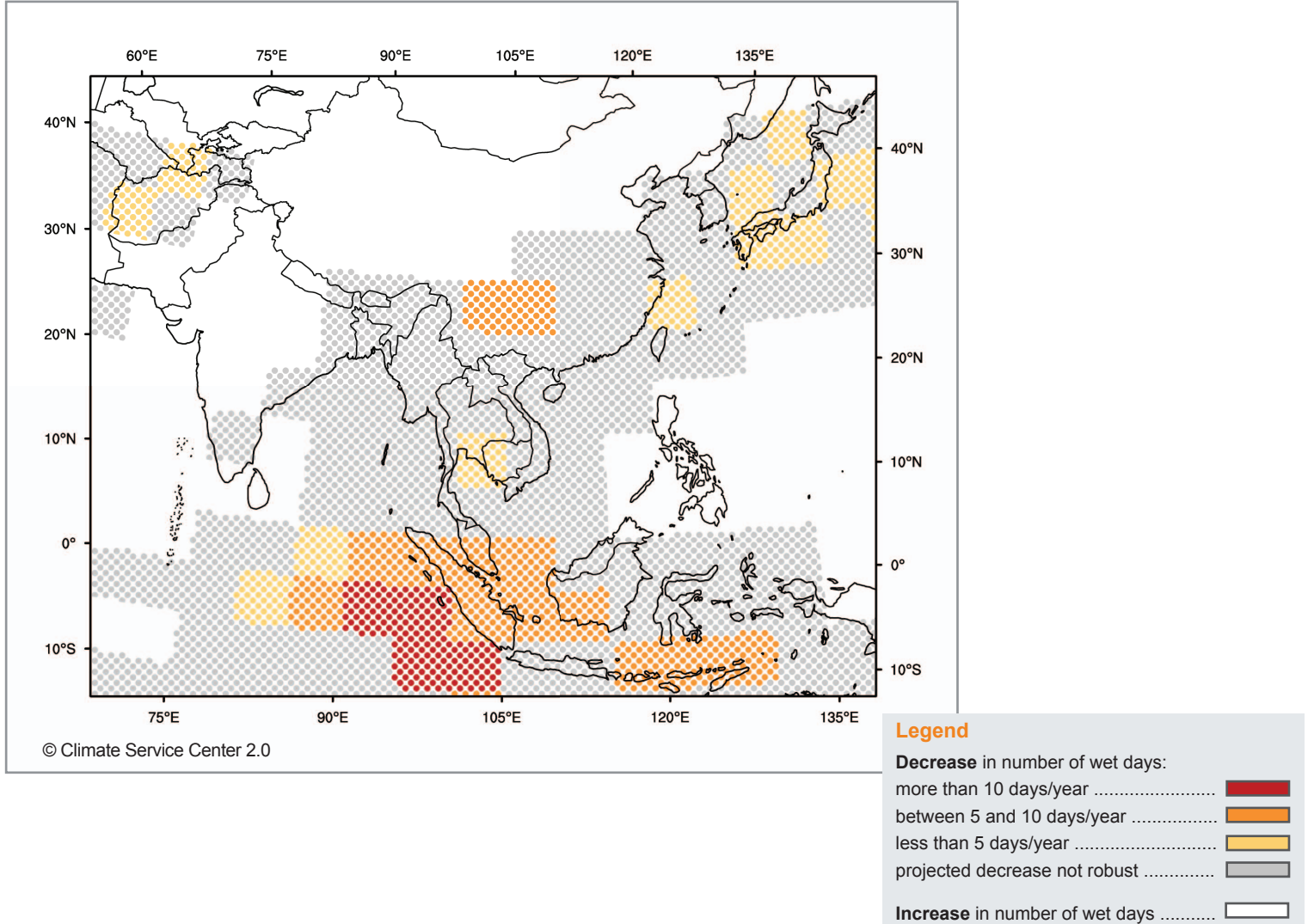
#### Short explanation of figure

- For most of Central Asia, the number of wet days per year is projected to increase.
- Decreasing numbers are projected only for the south-western region, where the projected decrease is mostly not robust.



### Regional distribution - Decrease in the mean number of wet days per year

#### South & East Asia



#### Short explanation of figure

- For north-western India, Pakistan, northern China, Uzbekistan, Kirghizia, southern Kazakhstan, Mongolia, and the Philippines, the number of wet days per year is projected to increase.
- For the remaining of South & East Asia, a decrease in the number of wet days is projected.
- The projected decrease is robust only for parts of Indonesia, Afghanistan, Japan, and small regions in southern China.