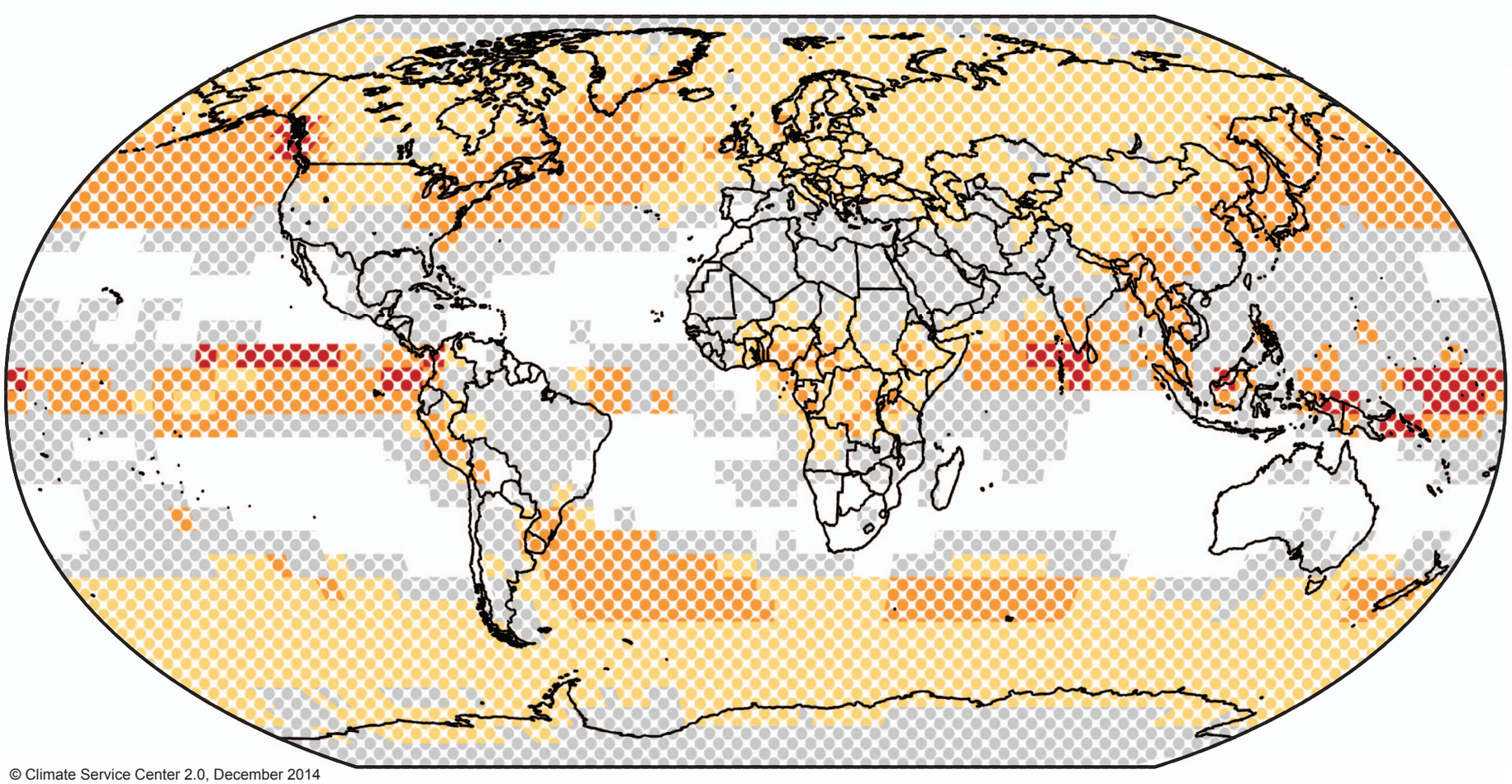
Climate-Signal-Map

Increase in annual number of days with more than 20mm/day of precipitation



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, resampeled 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

Legend

Increase in number of days with more than 20 mm/day of precipitation:

- more than/ equal to 3 days/year .....
- more than 1 and less than 3 days/year ...
- less than/ equal to 1 day/year .....
- projected increase not robust .....

Decrease in number of days with more than 20mm/day of precipitation .....

On behalf of

KFW

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Climate Service Center Germany 2.0

Eine Einrichtung des Helmholtz-Zentrums Geesthacht

Climate-Signal-Maps
Quickread

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Zusammenfassung

Climate-Signal-Maps
- können strategischen Portfolioideen dienen.
- sind ein Tool zur schnellen und leicht verständlichen Überprüfung der Robustheit der verfügbaren Klimaänderungs-informationen.
- 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.

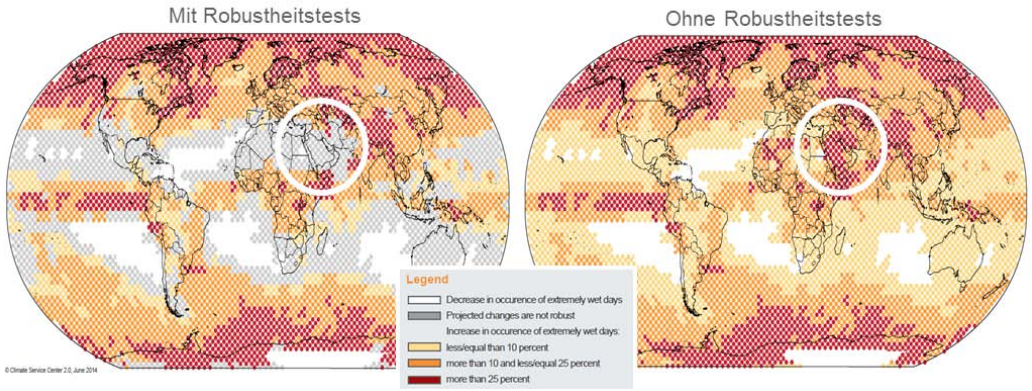
Test 3 – Sensitivität gegenüber kleinen zeitlichen Änderungen
Hier wird der Einfluss von dekadischen Schwankungen auf das Klimaänderungssignal untersucht. Insgesamt wird die Referenz- und die Klimaänderungsperiode 10 mal um jeweils 1 Jahr verschoben und dann getestet, ob sich die Mittelwerte der projizierten 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



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Hamburg, December 2014

Climate-Signal-Map

Supplementary material - **Days with more than 20 mm of precipitation**

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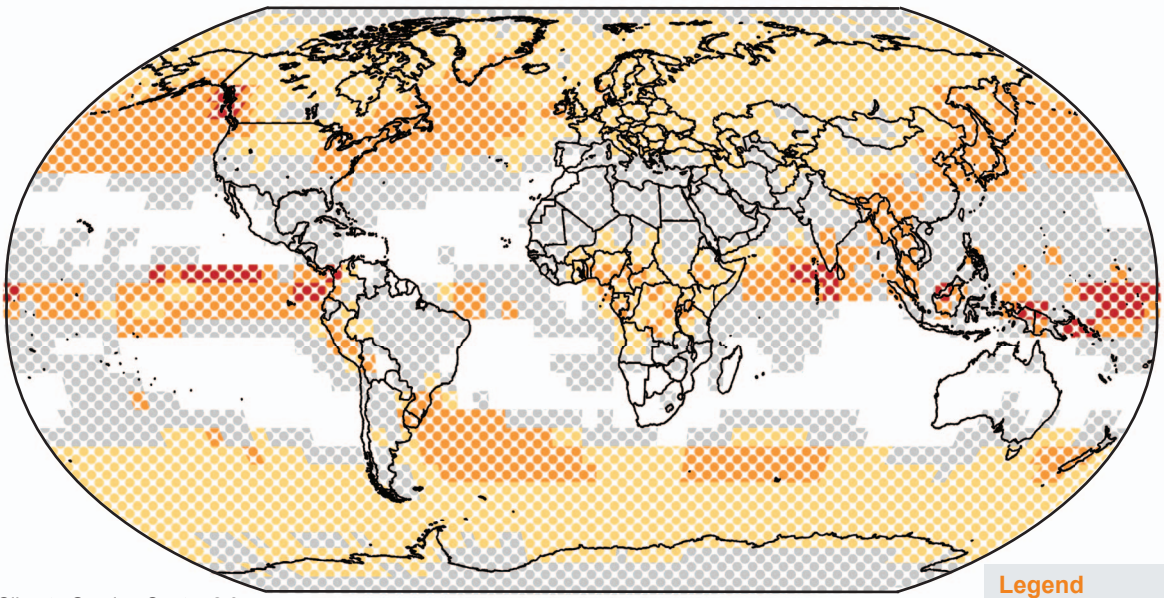
What is shown in the maps?

- The maps show the possible increase in the frequency of days per year with more than 20 mm of precipitation (heavy precipitation 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 a decrease in the occurrence of heavy precipitation days.
- Grey regions indicate where the projected increase in the frequency of days with more than 20 mm of precipitation is not robust.

Why is it interesting to know if days with more than 20 mm of precipitation will occur more frequent in the future?

- The knowledge about the future frequency of the excess of a fixed precipitation threshold is important for infrastructure/ facilities/processes which are constructed or dimensioned to cope with certain amounts of daily precipitation. More frequent heavy precipitation days could e.g.
  - impact on urban seawage systems.
  - impact on flood retention systems.
  - impact on road construction.
- However, depending on the region, 20mm/day might be a moderate value or a quite extreme one. For this reason, region specific indices based on the local precipitation statistics (see maps on very wet days and extremely wet days) might be advantageous.

Global distribution - Increase in annual number of days with more than 20mm of precipitation



Legend

Increase in number of days with more than 20 mm/day of precipitation:

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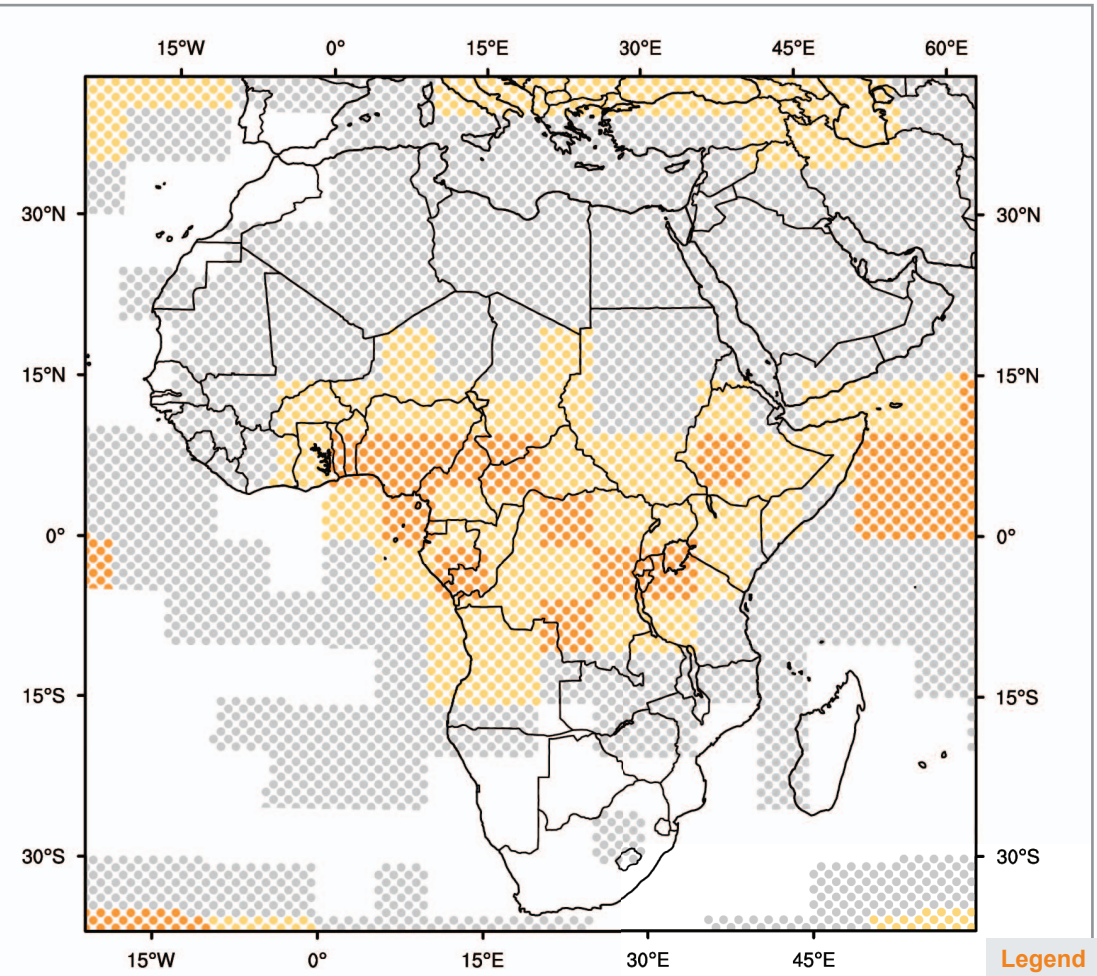
Regional distribution - Increase in annual number of days with more than 20mm of precipitation

Africa



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- projected increase not robust .....

Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- The annual number of days with more than 20 mm of precipitation per day is projected to increase for most of the African continent, except of the southern countries South Africa, Namibia, Botswana, southern Zimbabwe, Madagascar and southern Mozambique, and some small regions in the very north such as Morocco and northern West Sahara.
- The projected increase is robust for the countries close to the Equator but reaches only moderate values of less than +3days/year.

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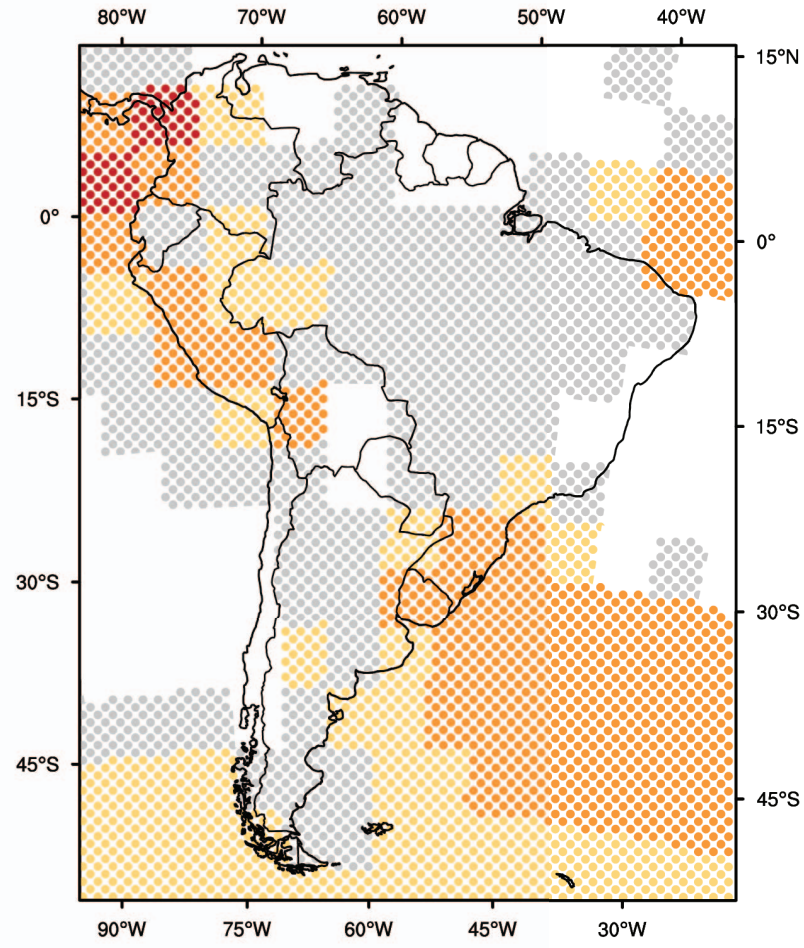
Regional distribution - Increase in annual number of days with more than 20mm of precipitation

South America



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- less than/equal to 1 day/year .....
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Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- For most of South America, the annual number of days with more than 20 mm of precipitation per day (heavy precipitation day) is projected to increase.
- Only for small parts of Chile, Bolivia, Argentina and Paraguay and for the northern countries Guyana, Suriname, and French Guyana and some parts of Venezuela, the number of heavy precipitation days is projected to decrease.
- The projected increase is robust only for Uruguay, the southernmost region of Brazil, Peru, and parts of Columbia.
- For most of the South American continent, the projected increases of heavy precipitation days are not robust.

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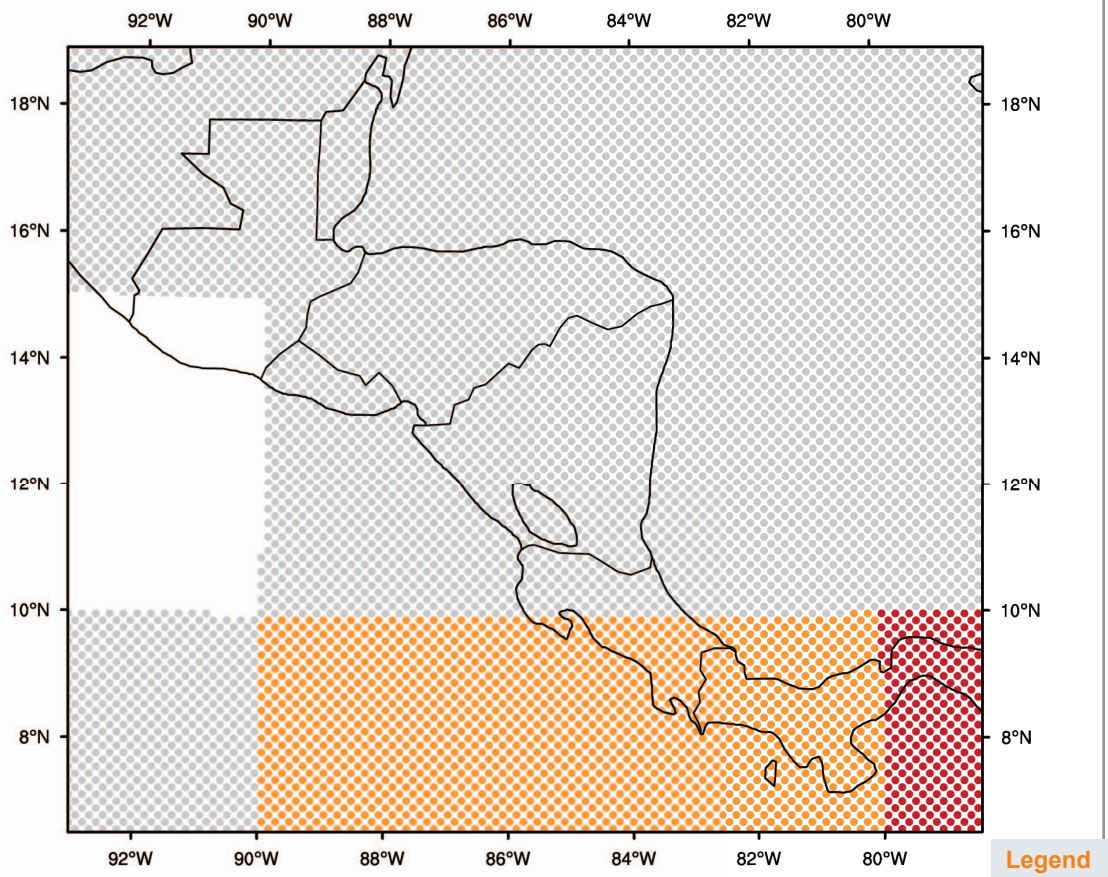
Central America



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- projected increase not robust .....

Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- For almost the entire region of Central America, the annual number of days with more than 20 mm of precipitation per day (heavy precipitation day) is projected to increase.
- The results are robust only for all land areas south of 10°N.
- For most of Central America, the projected increase in the number of heavy precipitation days is not robust.
- 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.

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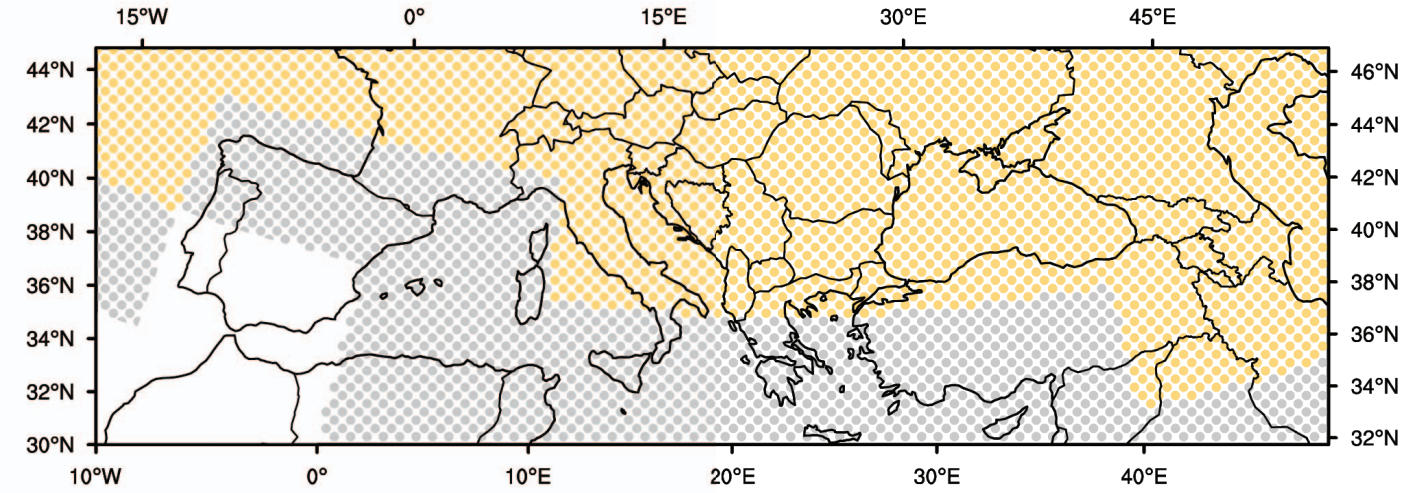
Regional distribution - Increase in annual number of days with more than 20mm of precipitation

Southern Europe & Caucasus



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- less than/equal to 1 day/year .....
- projected increase not robust .....

Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- For almost the entire region of Southern Europe & Caucasus, the annual number of days with more than 20 mm of precipitation per day (heavy precipitation day) is projected to increase (with the exception of southern Spain and southern Portugal).
- The results are robust for the northern and south-eastern part of the region.
- The projected increase in the number of heavy precipitation days has only very small values of less than +1day/ year.

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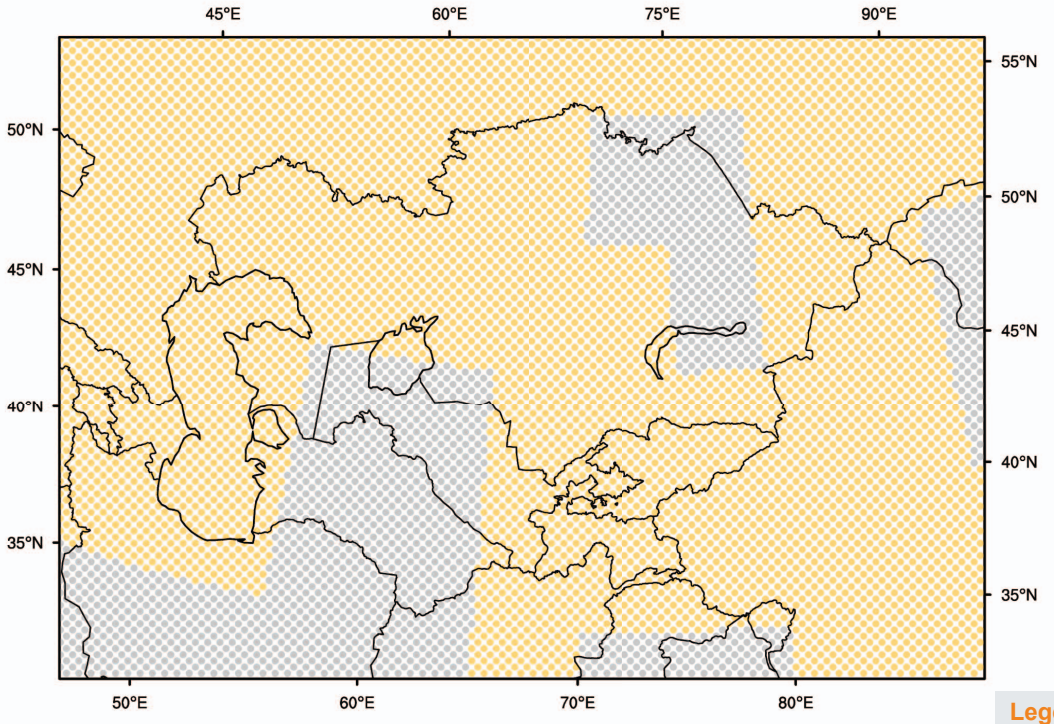
Central Asia



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- projected increase not robust .....

Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- For the entire region of Central Asia, the annual number of days with more than 20 mm of precipitation per day is projected to increase.
- The projected increase is robust for large parts of Central Asia, but reaches only very small values of less than +1day/year.

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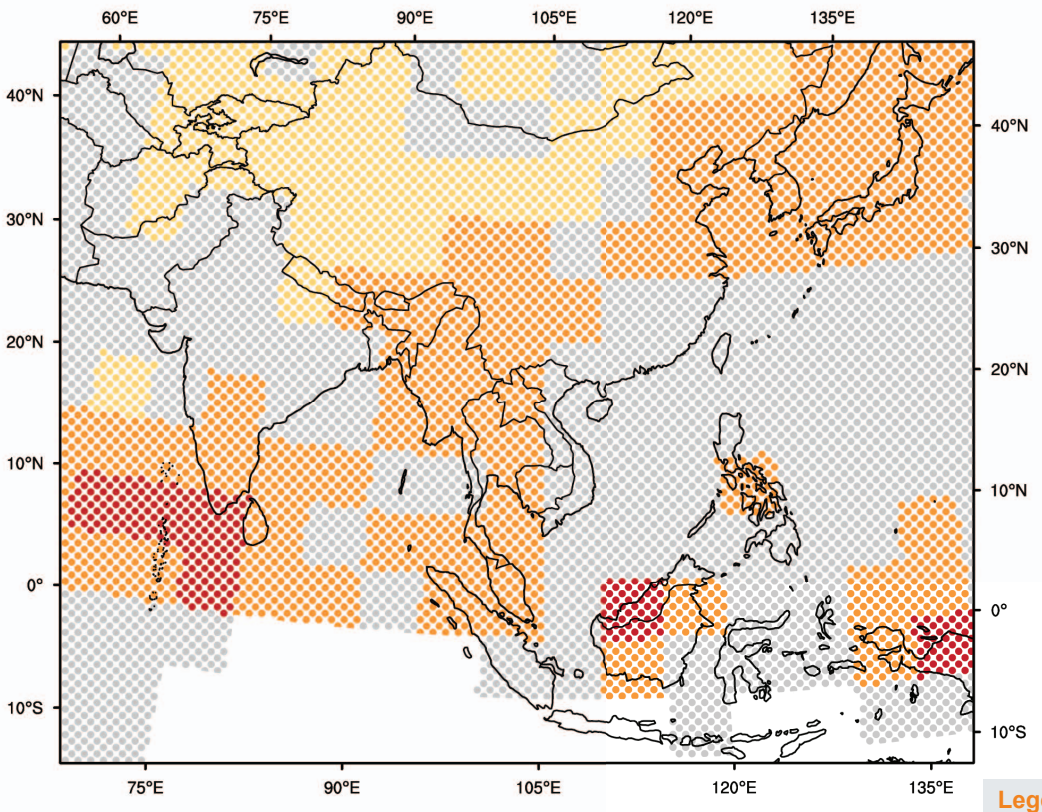
South & East Asia



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Decrease in number of days with more than 20mm/day of precipitation .....

Short explanation of figure

- For most of South & East Asia, the annual number of days with more than 20 mm of precipitation per day (heavy precipitation day) is projected to increase.
- A decrease of the number of heavy precipitation days can be found for parts of Indonesia.
- The projected increase is robust for southern India, western Afghanistan, Tadzhikstan, Kirghizia, southern Kazakhstan, large parts of China, Malaysia, for parts of the Philippines, for Corea, and Japan.

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