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Indonesia

In this section explore the latest projections about climate change

What is Indonesia's climate like?

- Indonesia is a large archipelagic nation of 5 main islands, 2 main archipelagos and more than 60 smaller archipelagos lying between latitudes of 6° N and 11° S of the equator, and longitudes of 95 to 142° E
- The islands are very mountainous, with more than 150 active volcanoes
- Indonesia's climate is typically equatorial with hot and humid conditions throughout the year, at around 26° in most regions. In the mountains it is cooler
- The seasonal movements of the Inter-Tropical Convergence Zone (ITCZ), controls the region's rainfall. The wet-season peaks in January and February when the ITCZ is in its southern-most position, and the driest months are through July to September when the ITCZ is north of South-east Asia
- Indonesia's position between the Indian and Pacific oceans means that its climate is strongly influenced by conditions in both of these oceans. It experiences year-to-year variability in climate linked with both the El Nino Southern Oscillation (ESNO) and the Indian Ocean Dipole (IOD)
- El Nino influences the monsoons in the region; generally bringing warmer and drier conditions. La Nina brings wetter and colder conditions

Graph one: How did Indonesia's temperature change between 1960 and 2009?

- The black line shows temperature anomaly for each year from 1960 to 2000. This is the difference, compared to average temperatures recorded between 1970 and 1999
- The brown shading shows the range of temperature anomalies
- Since 1960 mean annual temperature has increased by 0.64°C – around 0.14° C per decade
- Observed temperature increases have been more rapid over the larger western islands in the west of Indonesia

Graphs two to four: How will Indonesia's annual temperature change during the 2030s, 60s and 90s?

- These maps show projected temperature change during the 2030s, 60s and 90s in different areas of Indonesia (according to a high emissions scenario)
- All values are anomalies - compared to the mean climate of 1970 to 1999
- Areas shaded deep orange will be 6°C hotter than average temperatures from 1970 to 1999, whereas areas shaded green will be the same
- The tiny numbers in the centre of each grid box is the average expected temperature; numbers in the upper and lower corners give the maximum and minimum temperatures
- The most rapid temperature increases will occur over the larger Islands of Indonesia and less rapidly over the sea and smaller islands

Graphs five to seven: How will Indonesia's temperature change seasonally? – December, January, February

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- These 3 maps show projected January, February and March (JFM) temperatures in the 2030s, 60s and 90s (according to a high carbon dioxide emissions scenario, A2)
- All values are anomalies– the difference in temperature to the average of 1970 to 1999 temperatures
- Areas shaded red will be 6-7°C hotter than average temperatures from 1970 to 1999, whereas areas shaded green will be the same as the 1970-1999 average
- The number in the centre of each grid box is the average projected temperature; numbers in the upper and lower corners give the highest and lowest possible JFM mean temperature
- Temperature increases are approximately the same for all seasons
- Temperature increase is expected to be slightly greater in the wet season (OND and JFM) - approximately 0.35°C per decade

Graphs eight to 10: How will Indonesia's temperature change seasonally? – March, April, May

- These 3 maps show projected April, May and June (AMJ) temperatures in the 2030s, 60s and 90s (according to a high carbon dioxide emissions scenario, A2)
- All values are anomalies – the difference in temperature to the average of 1970 to 1999 temperatures
- Areas shaded red will be 6-7°C hotter than average temperatures from 1970 to 1999, whereas areas shaded green will be about the same as the 1970-1999 average
- The number in the centre of each grid box is the average projected temperature; numbers in the upper and lower corners give the highest and lowest possible AMJ mean temperature
- Temperature increases are approximately the same for all seasons
- Temperature increase is expected to be slightly less in the dry season (AMJ and JAS) – approximately 0.34°C per decade

Graphs 11 to 13: How will Indonesia's temperature change seasonally? – June, July, August

- These 3 maps show projected July, August and September (JAS) temperatures in the 2030s, 60s and 90s (according to a high carbon dioxide emissions scenario, A2)
- All values are anomalies – the difference in temperature to the average of 1970 to 1999 temperatures
- Areas shaded red will be 6-7°C hotter than average temperatures from 1970 to 1999, whereas areas shaded green will be about the same as the 1970-1999 average
- The number in the centre of eachgrid box is the average JAS temperature anomaly we expect having had high carbon dioxide emissions; the smaller numbers in the upper and lower corners give the range of average temperature anomalies that might occur
- Temperature increases are approximately the same for all seasons
- Temperature increase is expected to be slightly less in the dry season (AMJ and JAS)- approximately 0.33°C per decade

Graphs 14 to 16: How will Indonesia's temperature change seasonally? – September, October, November

- These 3 maps show projected October, November and December (OND) temperatures in the 2030s, 60s and 90s (according to a high carbon dioxide emissions scenario, A2)
- All values are anomalies – the difference in temperature to the average of 1970 to 1999 temperatures
- Areas shaded red will be 6-7°C hotter than average temperatures from 1970 to 1999, whereas areas shaded green will be about the same as the 1970-1999 average
- The number in the centre of each grid box is the average OND temperature anomaly we expect having had high carbon dioxide emissions; the smaller numbers in the upper and lower corners give the range of average temperature anomalies that might occur
- Temperature increases are approximately the same for all seasons
- Temperature increase is expected to be slightly more in the wet season (OND and JFM)- approximately 0.35°C per decade

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Graphs 17 to 18: How will Indonesia's frequency of hot days change?

- These two maps show the percentage of hot days expected during the 2060s and 2090s given high carbon dioxide emissions through the century (scenario A2)
- A hot day is defined by the temperature exceeded on 10% of days in 1970-1999. So, in 1970–1999, you would have expected 1 in 10 days to be hot. If the map shading indicates that more than 10% of days are hot, then there has been an increase in the number of hot days
- In areas shaded deep red, every day will be a hot day. Yellow areas will have 30% hot days
- The number in the centre of each grid box is the number of hot days we expect; the smaller numbers in the upper and lower corners give the range of numbers of hot days that might occur
- Hot days will become more frequent in all areas of Indonesia
- Hot days will occur on 35-79% of days by the 2060s, and 48-95% of days by the 2090s. This rate of increase is similar in all seasons

Graphs 19 to 20: How will Indonesia's frequency of hot nights change?

- These two maps show the percentage of hot nights expected during the 2060s and 2090s given high carbon dioxide emissions through the century (scenario A2)
- A hot night is defined by the temperature exceeded on 10% of nights in 1970-1999. So, in 1970 – 1999, you would have expected 1 in 10 nights to be hot. If the map shading indicates that more than 10% of nights are hot, then there has been an increase in the number of hot nights
- In areas shaded deep red, every night will be a hot night. Yellow areas will have 30% hot nights
- The number in the centre of each grid box is the number of hot nights we expect; the smaller numbers in the upper and lower corners give the range of numbers of hot nights that might occur
- The frequency of hot nights has increased significantly since 1960 in every season – especially summer (JAS)
- Hot nights will occur on 49-95% of nights by the 2060s and 63-99% of nights by the 2090s. This rate of increase is similar in all seasons
- Cold days and nights will become less frequent, no longer occurring at all in most models by the 2060s, and no longer occurring under any of the carbon dioxide emission scenarios by the 2090s

Graph 21: How will Indonesia's precipitation change?

- This graph shows the 'precipitation anomaly' – the difference in rain or snowfall to the 1970-1999 average. If the graph shows a positive number, then it is wetter than the 1970-1999 average. If the graph shows a negative number, then it is drier
- The black line shows the actual precipitation anomaly for each year from 1960 to 2006. This is the difference in rain/ snowfall between the year's recorded precipitation and the average of all years between 1970 and 1999
- The brown line shows past precipitation anomalies as produced by a computer model with the brown shading showing the range produced by the model
- There are, however, large spatial and seasonal variations in predicted rainfall changes. The easternmost islands generally will have greatest increases in rainfall (-6 to +38%) by the 2090s
- Mean rainfall over Indonesia has decreased significantly in every season, at an average rate of 7.8mmper month (3.6%) per decade since 1960
- Trends are similar in all seasons, varying between -7.5mm (3.3%) per decade in OND to -8.9mm per month (3.6%) per decade, but the greatest proportional decreases have been seen in the dry season JAS, at -4.8% per decade
- Indonesia is predicted to become wetter, with an overall increase in rainfall, with the range of changes in annual rainfall simulated by different models varies between -28 and +53mm per month (-12% to +20%) by the 2090s

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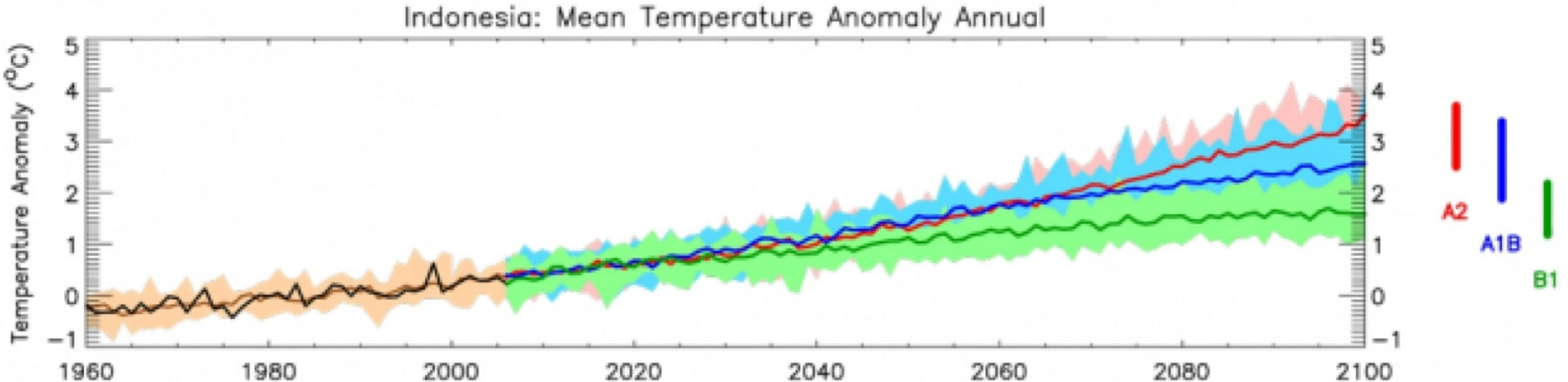
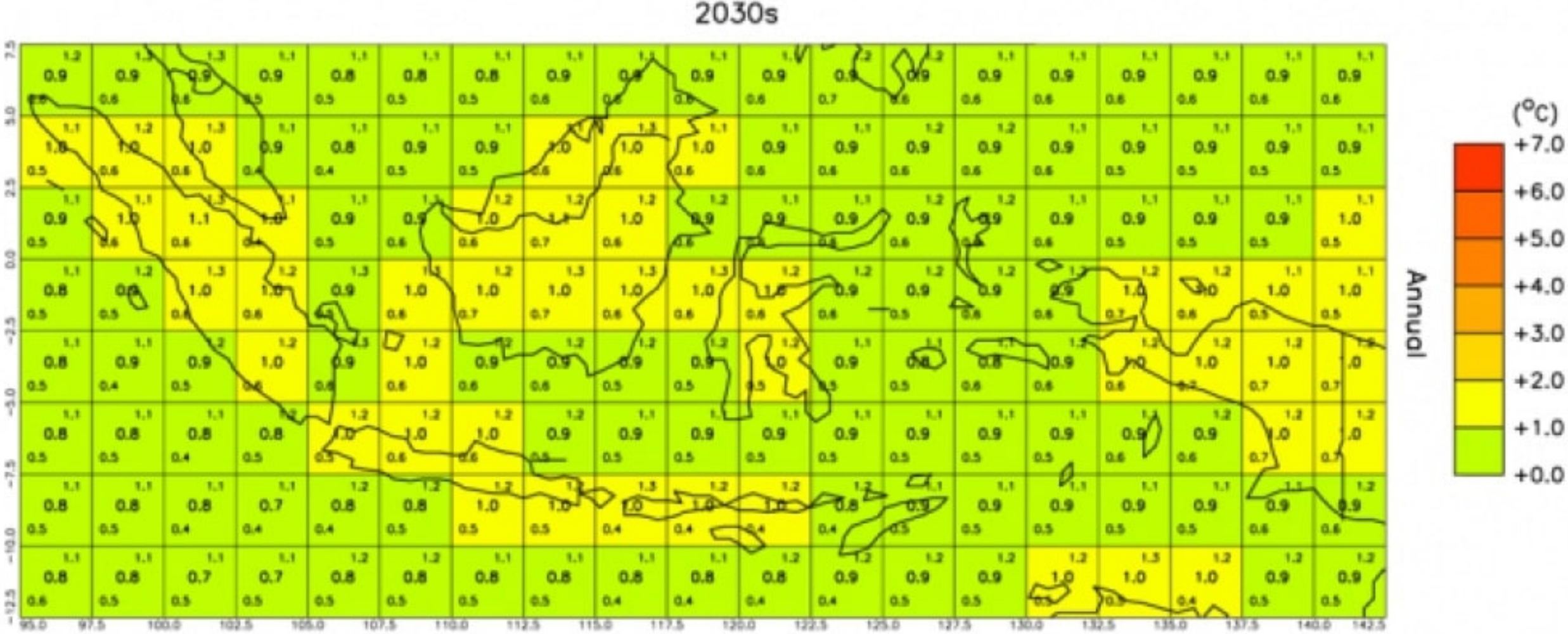
- There are, however, large spatial and seasonal variations in predicted rainfall changes. The easternmost islands generally will have greatest increases in rainfall (-6 to +38%) by the 2090s
- The proportion of total annual rainfall that falls in heavy events is projected to increase by all the models, by up to an additional 15% by the 2090s.


Indonesia: Mean Temperature Anomaly Annual
Temperature Anomaly (°C)
5
4
3
2
1
0
−1
1960
1980
2000
2020
2040
2060
2080
2100
A2
A1B
B1


2030s
Annual
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0
7.5
5.0
2.5
0.0
-2.5
-5.0
-7.5
-10.0
-12.5
95.0
97.5
100.0
102.5
105.0
107.5
110.0
112.5
115.0
117.5
120.0
122.5
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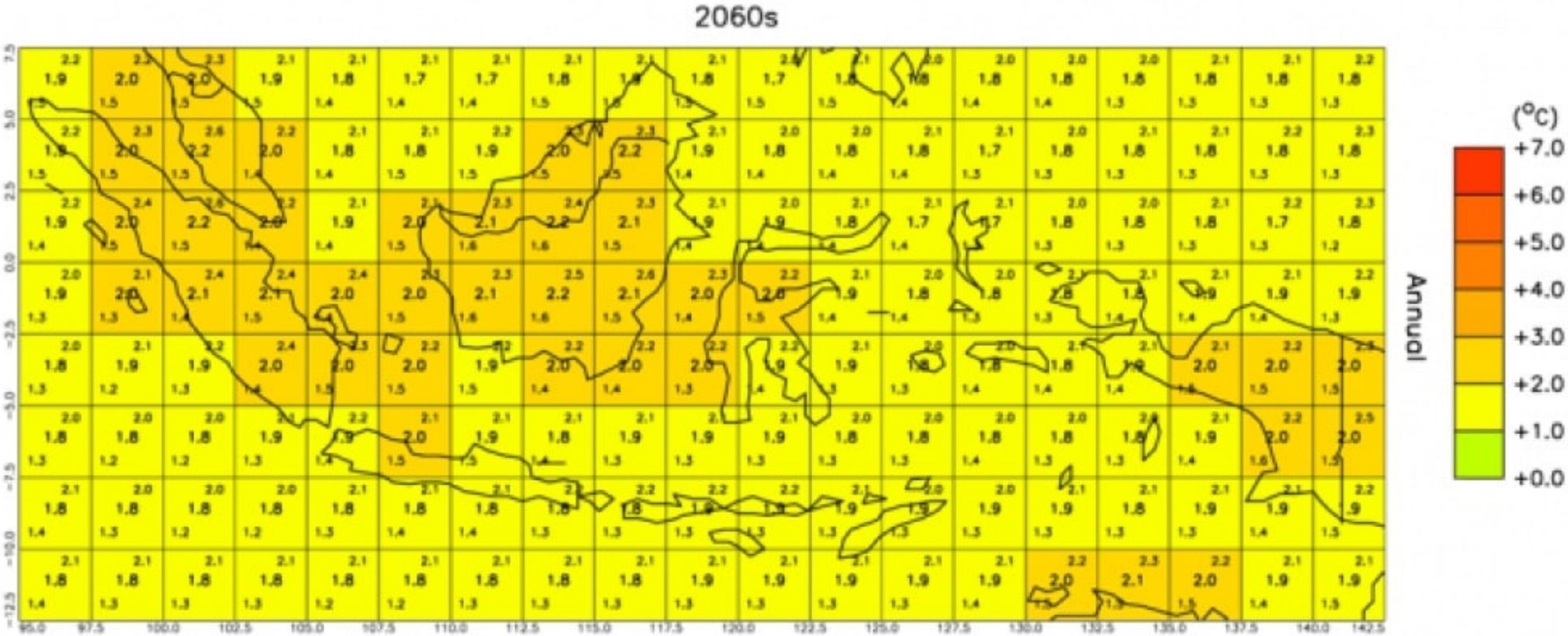
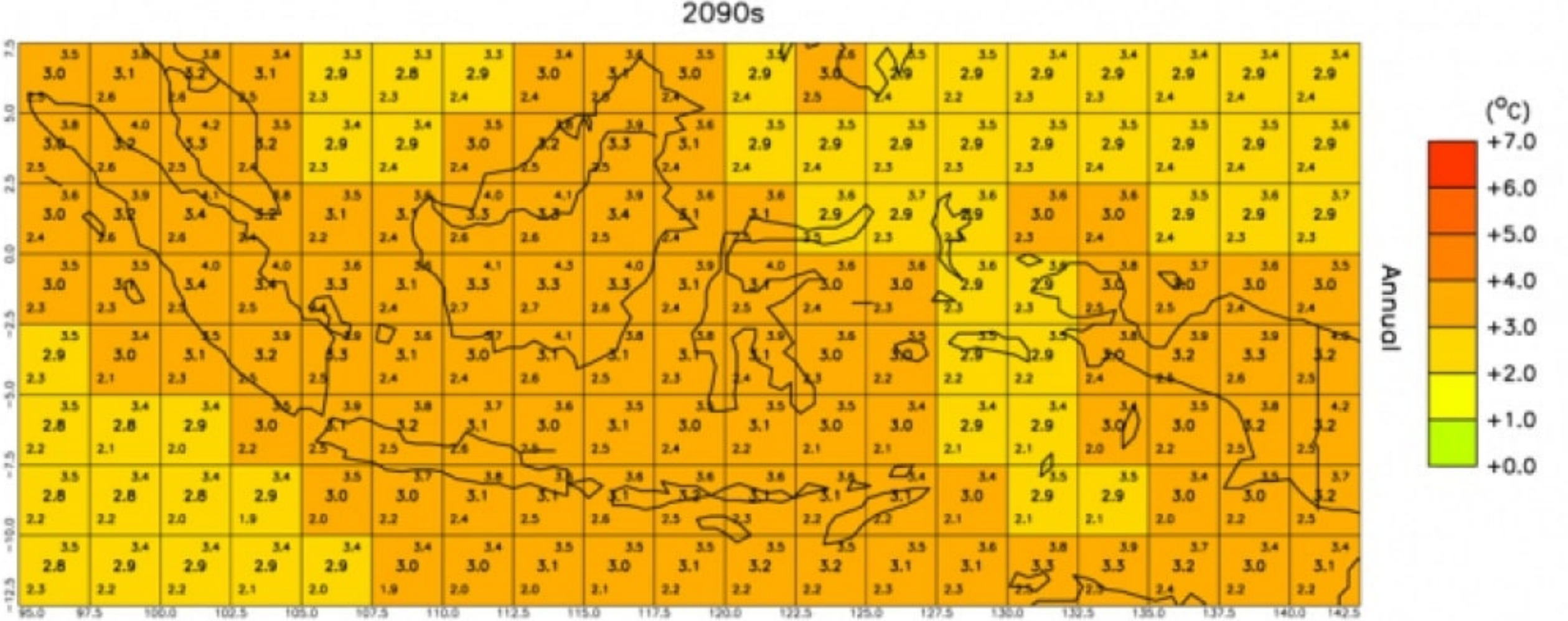
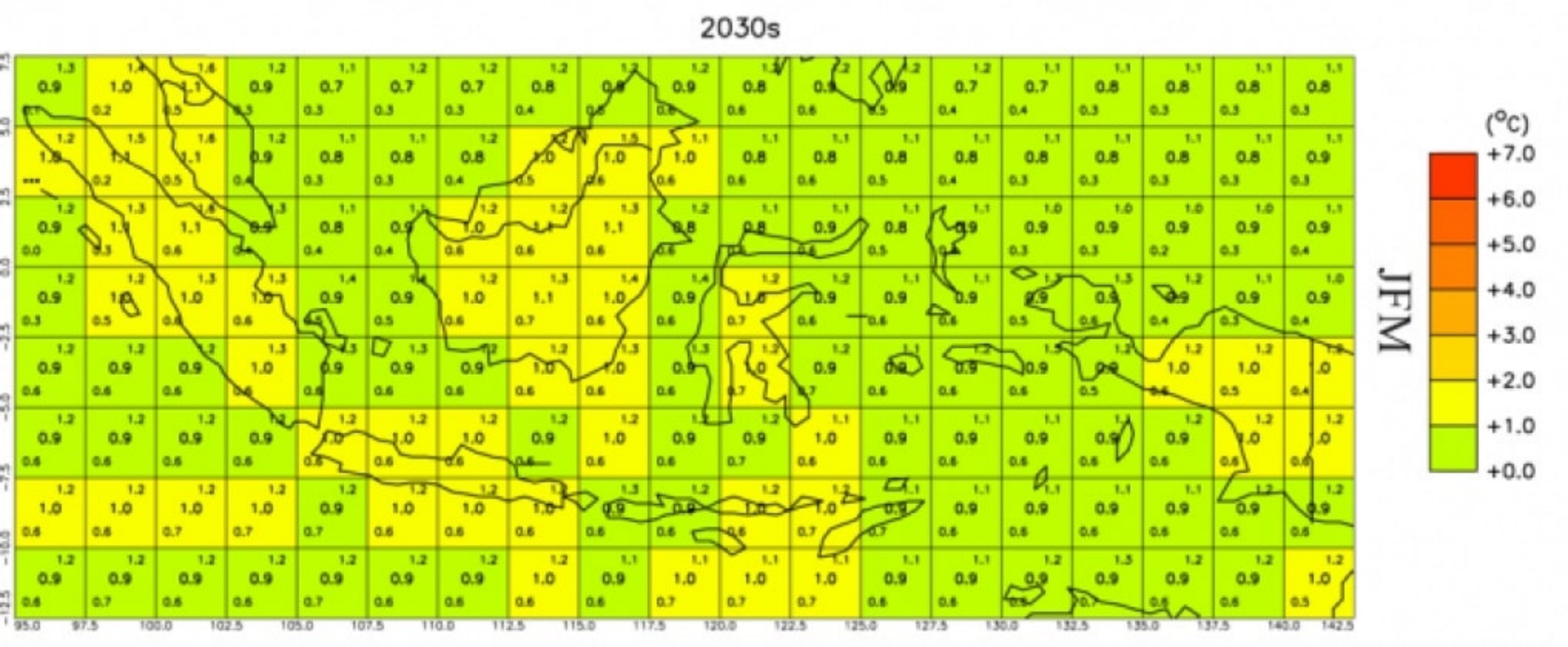
127.5
130.0
132.5
135.0
137.5
140.0
142.5


2060s
Annual
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2090s
Annual
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2030s
JFM
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0
95.0
97.5
100.0
102.5
105.0
107.5
110.0
112.5
115.0
117.5
120.0
122.5
125.0
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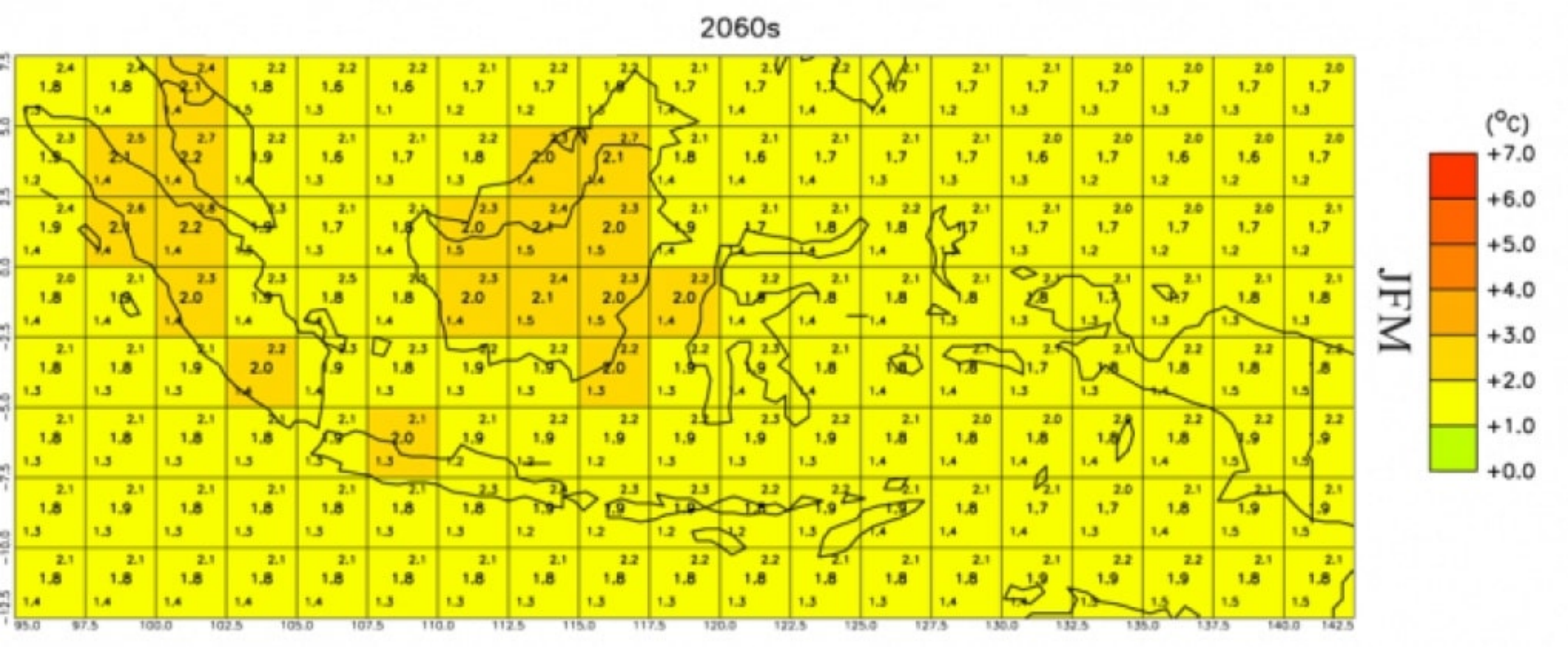
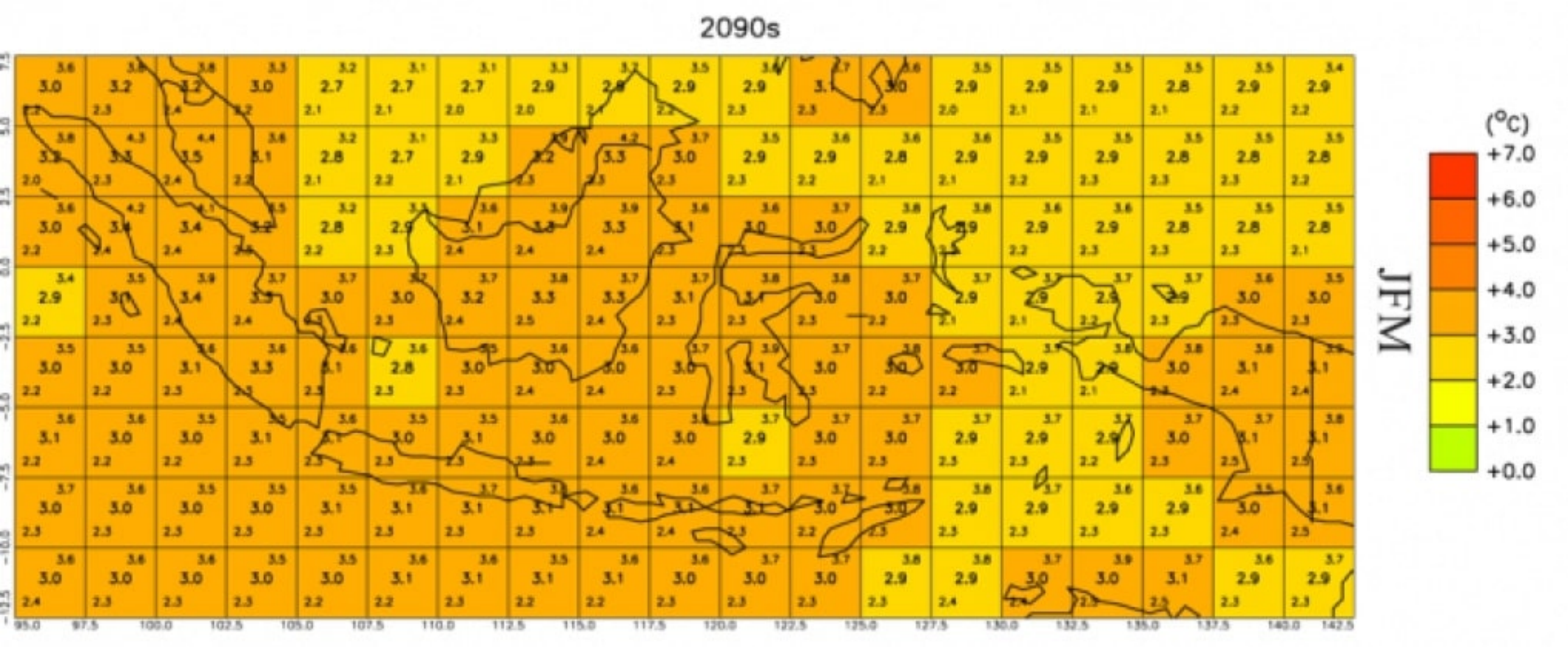
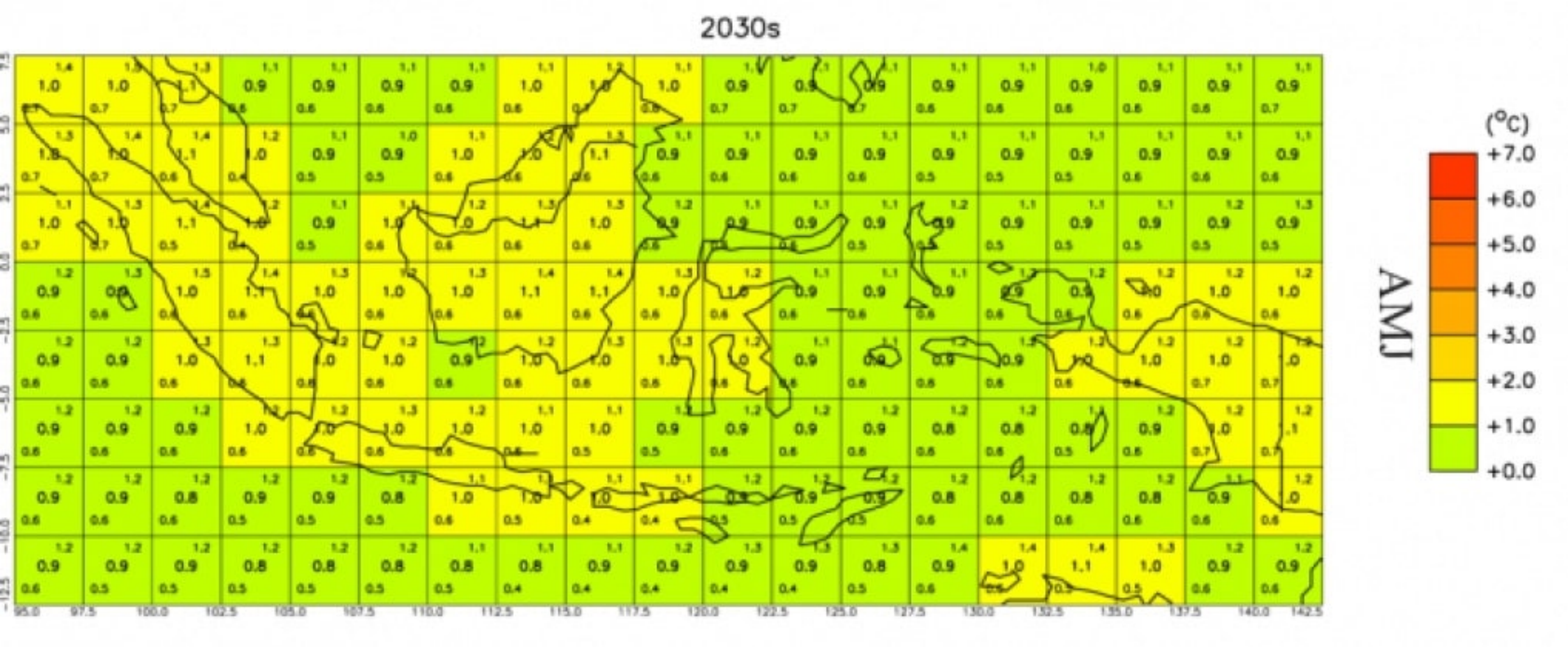
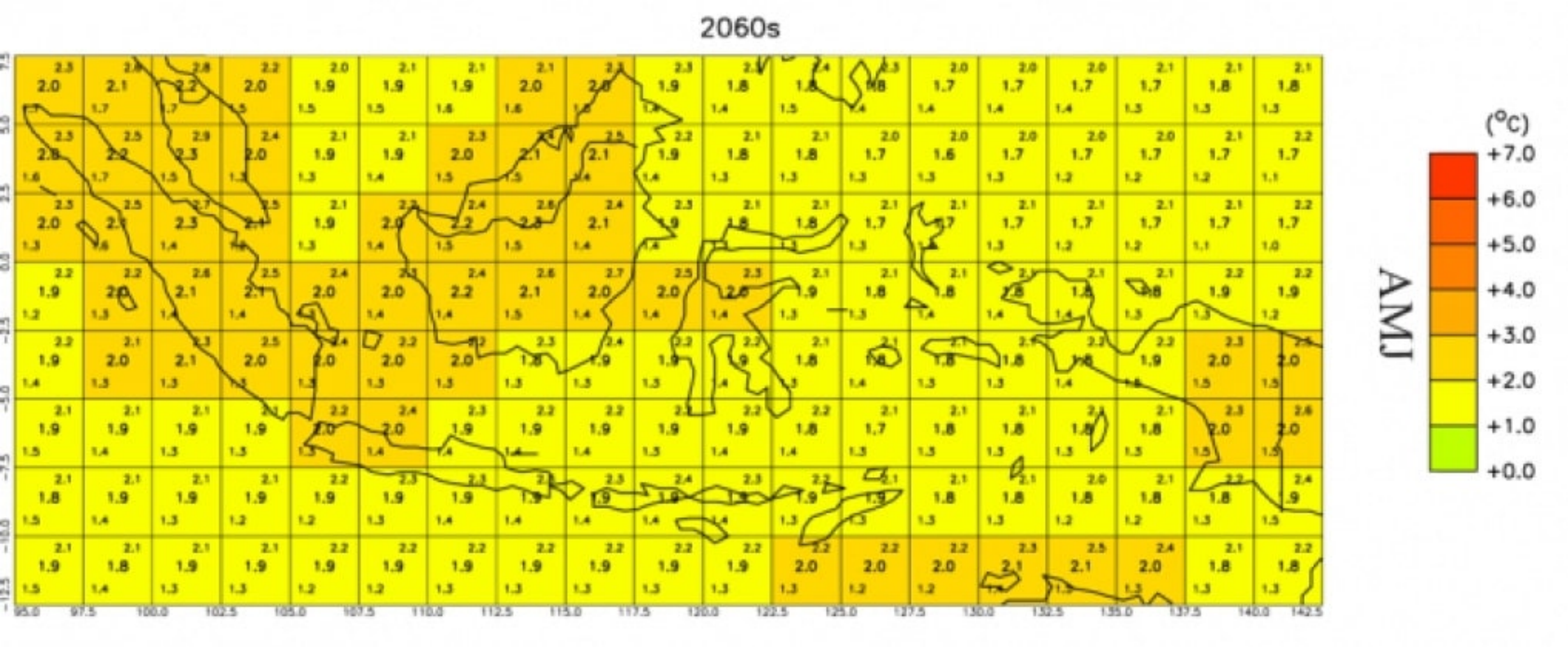
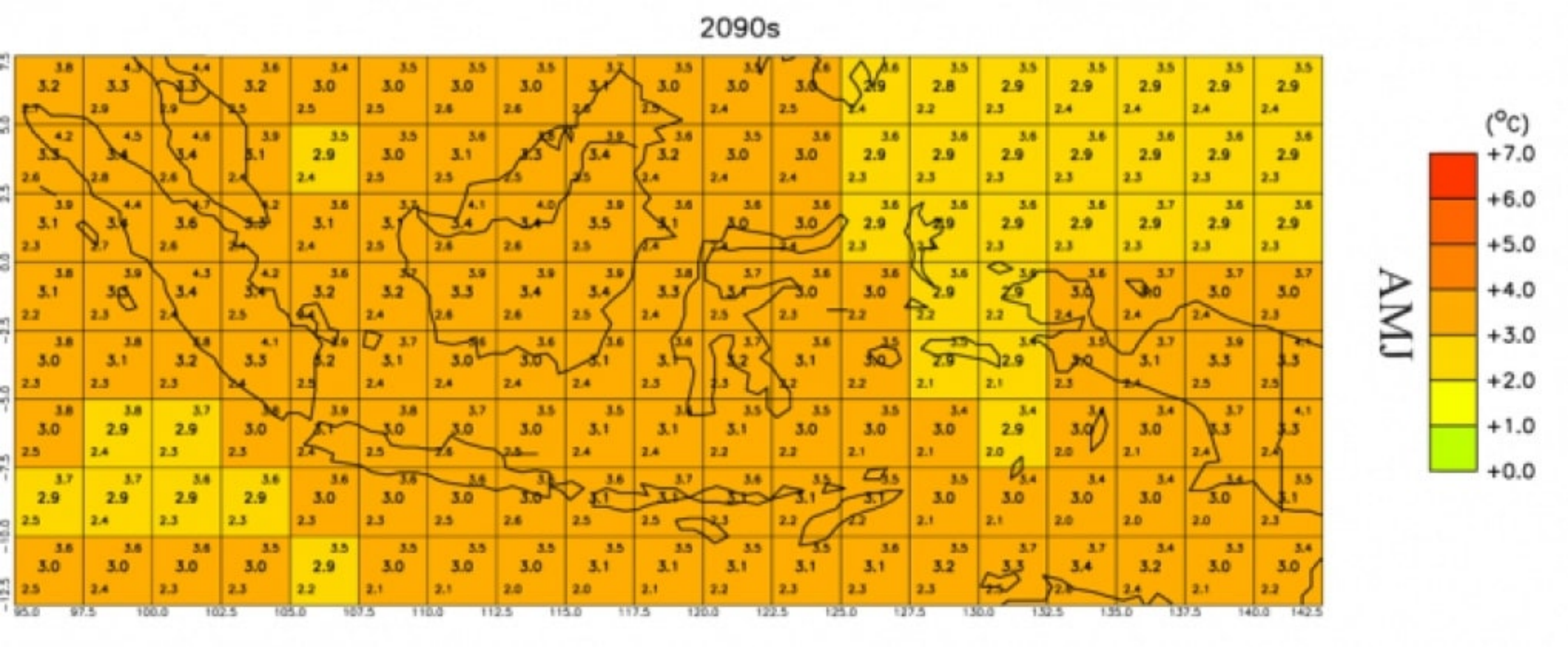
130.0
132.5
135.0
137.5
140.0
142.5

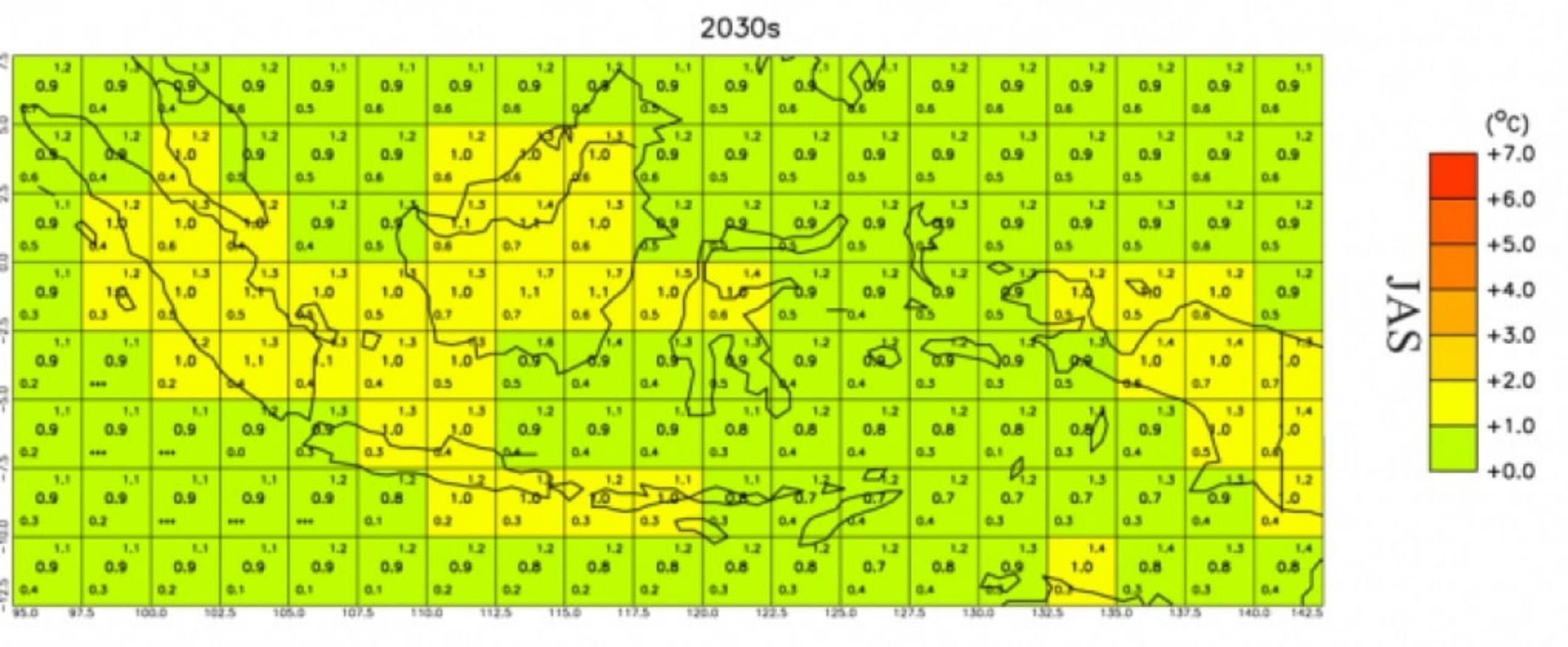

2060s
JFM
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

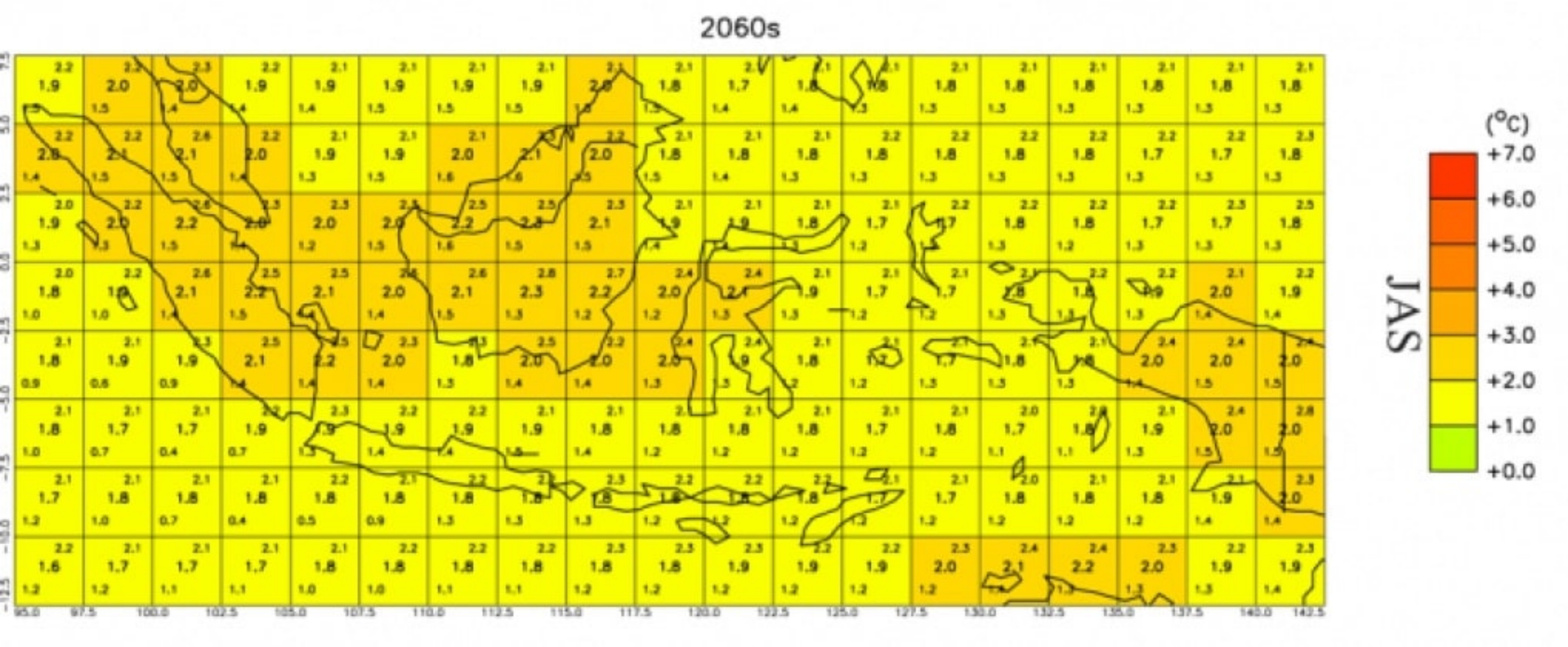

2090s
JFM
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

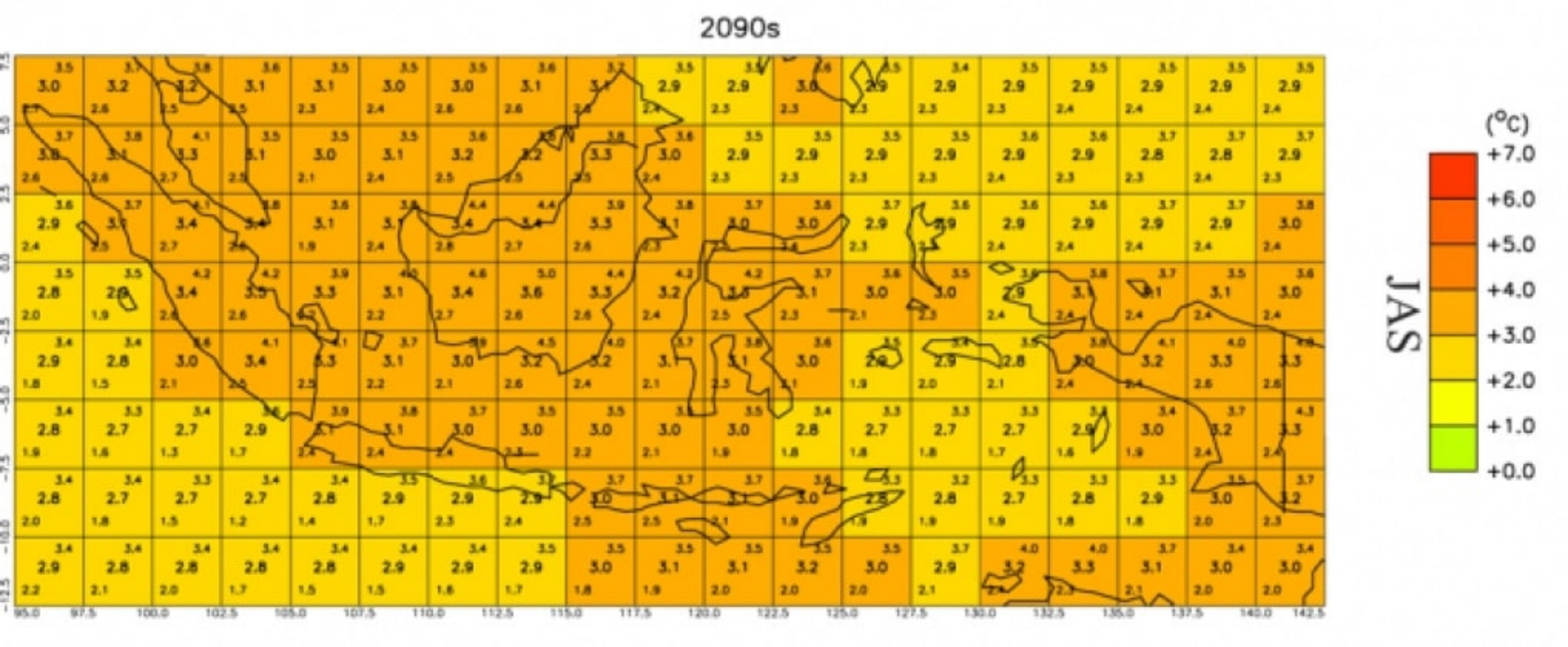

2030s
AMJ
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

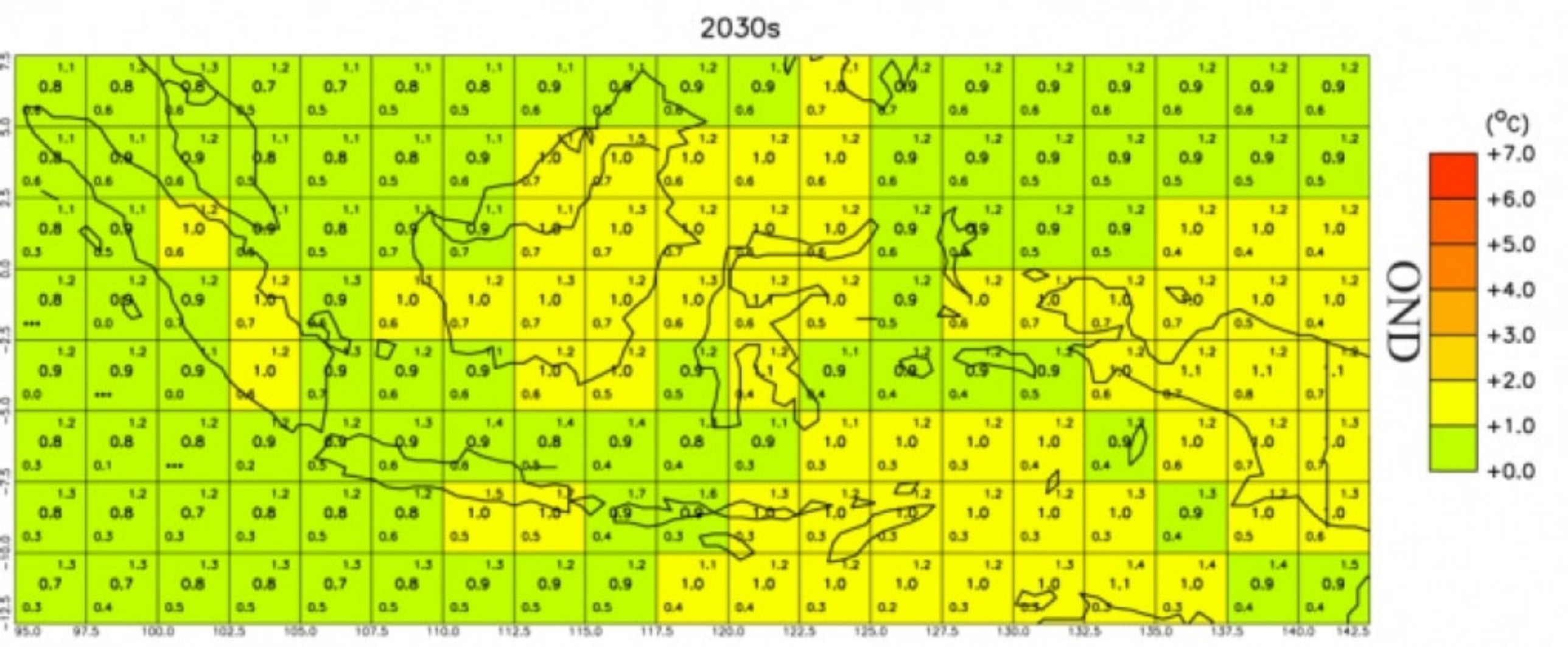

2060s
AMJ
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

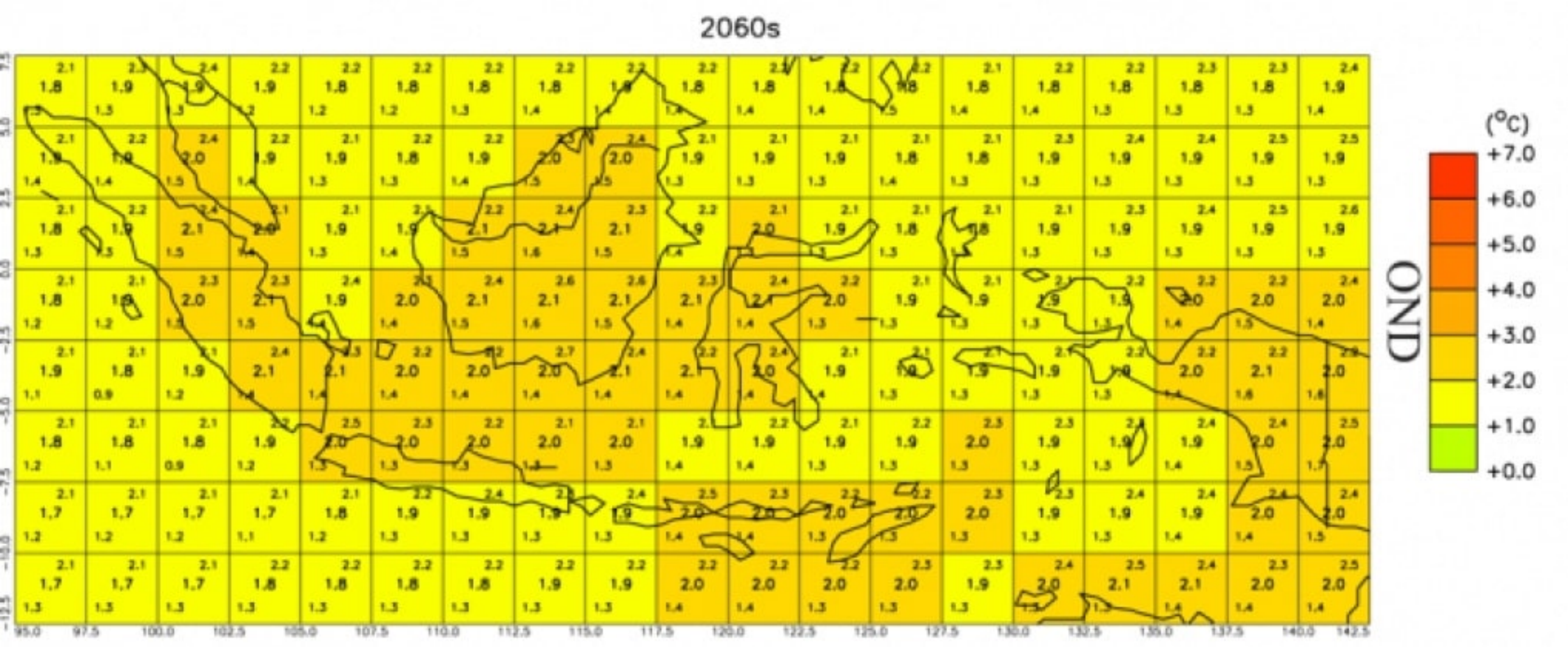

2090s
AMJ
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

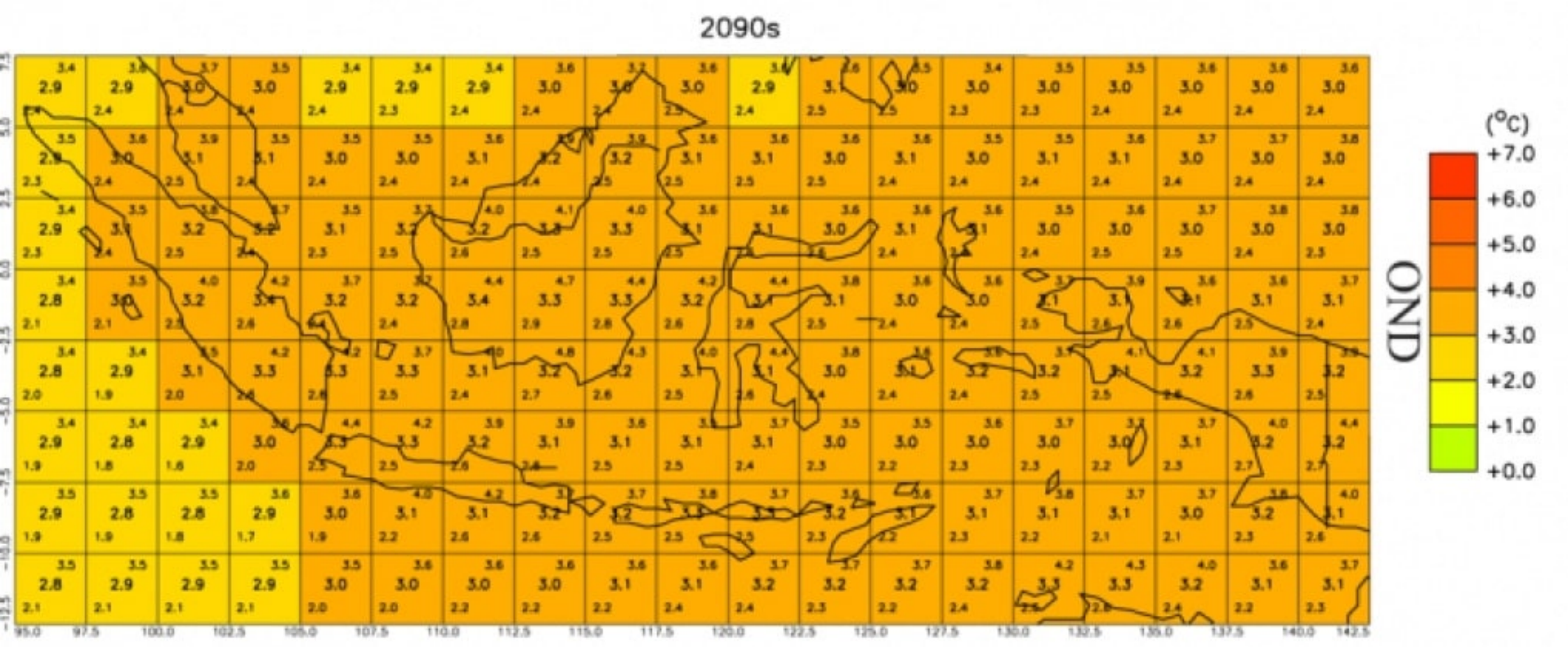

2030s
JAS
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2060s
JAS
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2090s
JAS
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

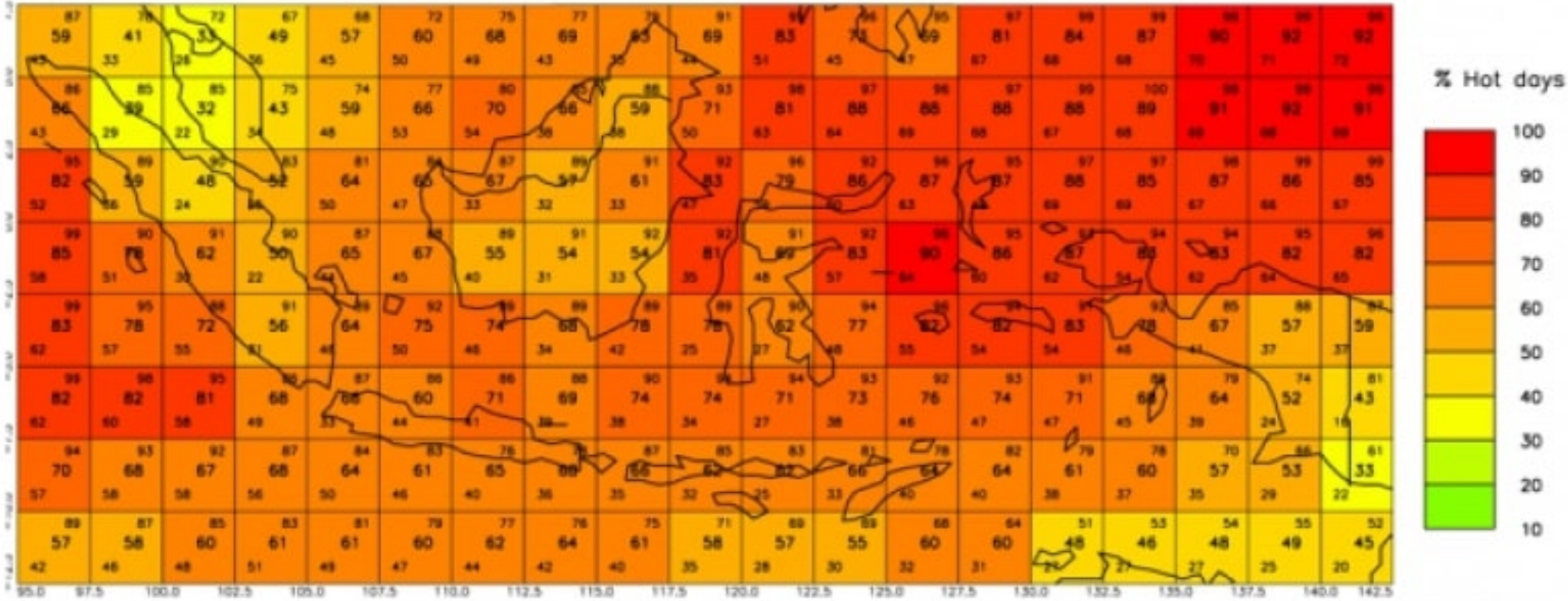

2030s
OND
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2060s
OND
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0


2090s
OND
(°C)
+7.0
+6.0
+5.0
+4.0
+3.0
+2.0
+1.0
+0.0

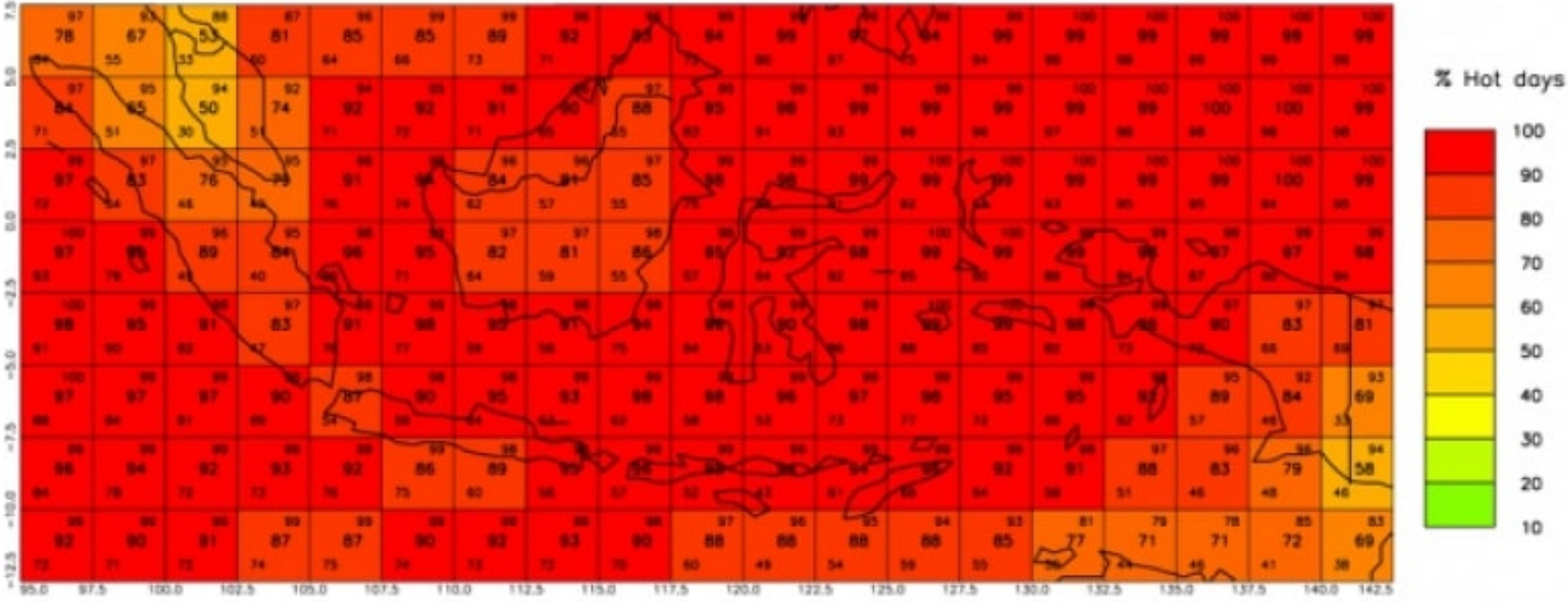
UK

Annual 2060s

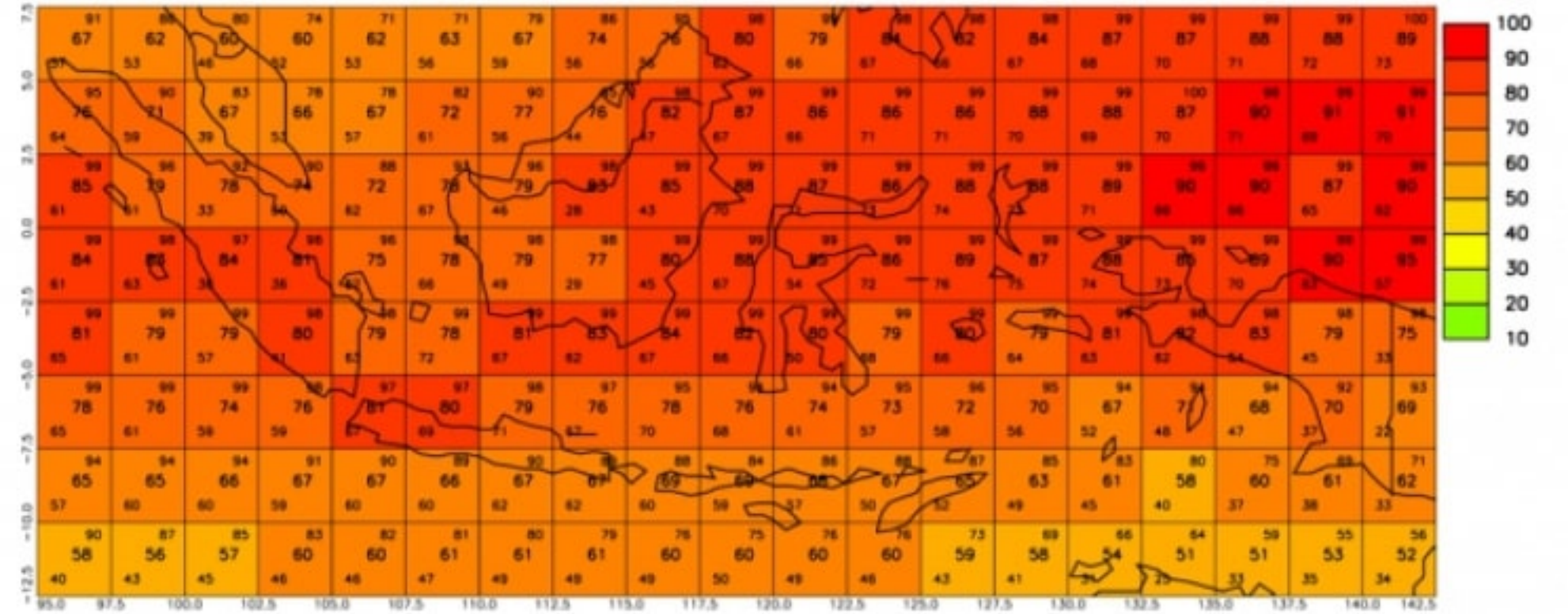


UK

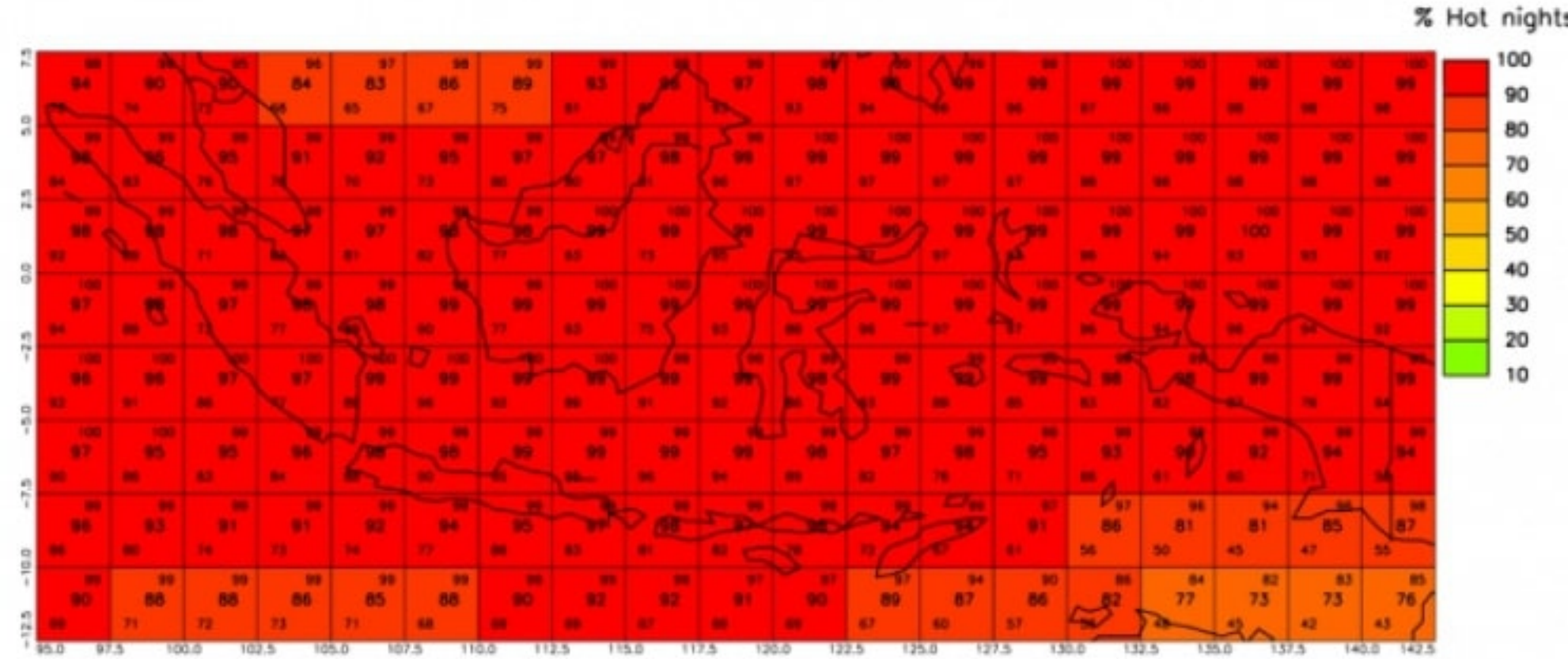
Annual 2090s

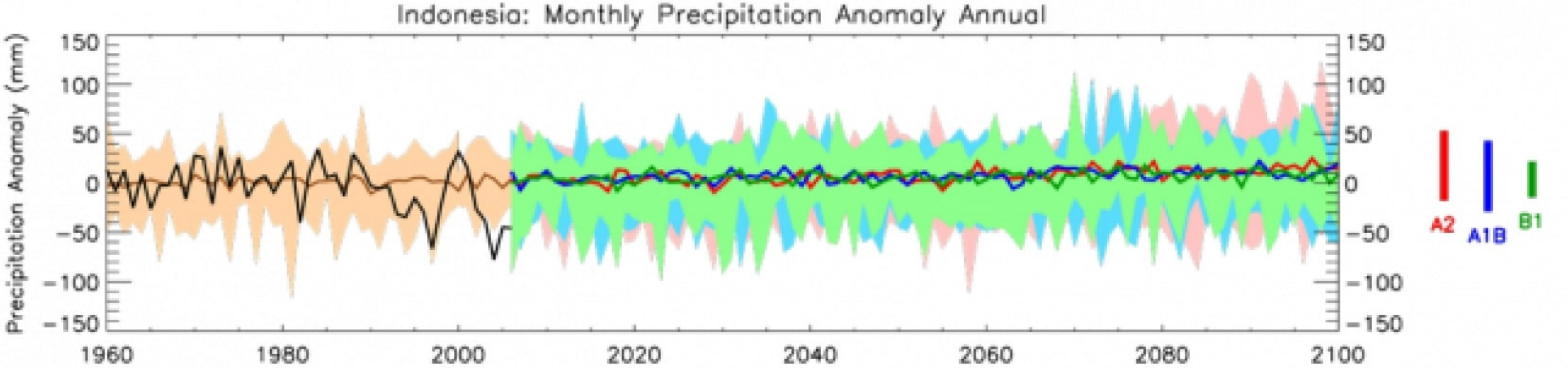


Annual 2060s



Annual 2090s




Indonesia: Monthly Precipitation Anomaly Annual
Precipitation Anomaly (mm)
150
100
50
0
−50
−100
−150
1960
1980
2000
2020
2040
2060
2080
2100
A2
A1B
B1