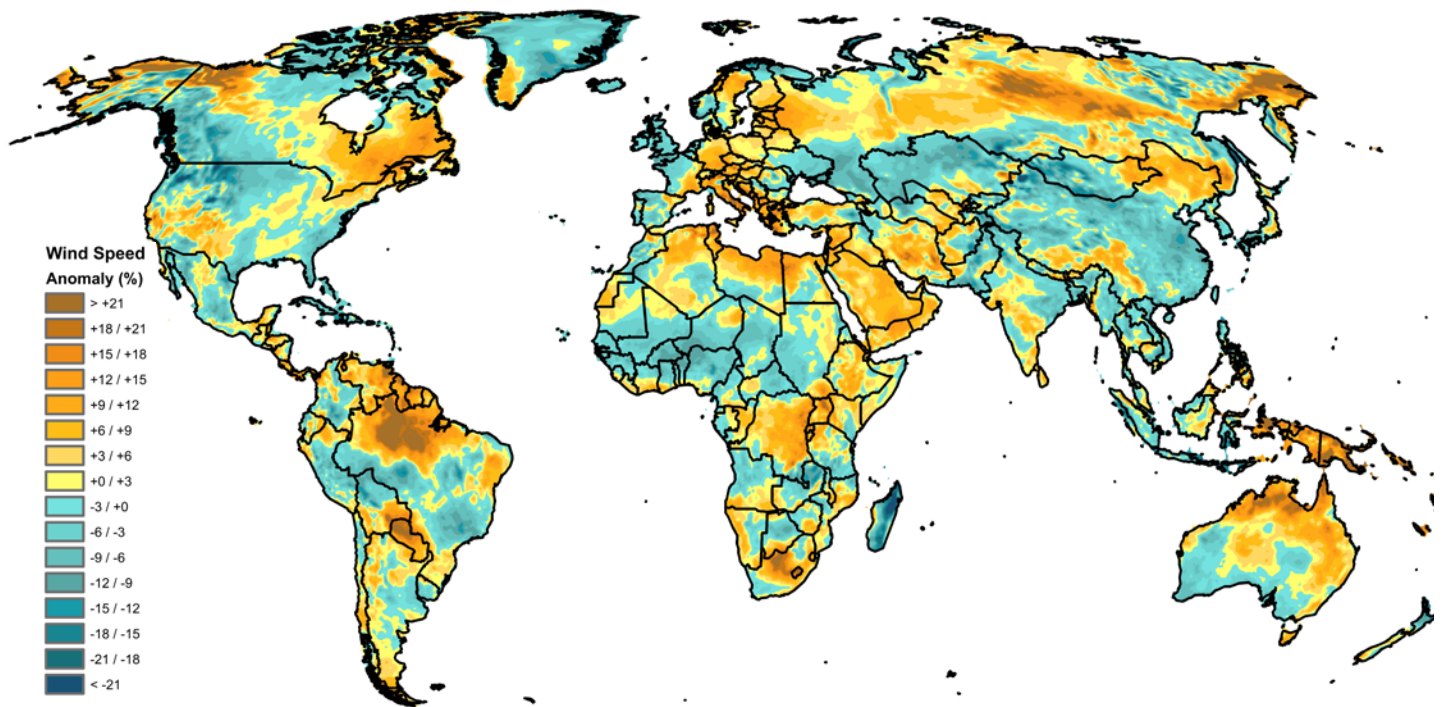


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GLOBAL

Q1 2019

Global wind speeds in the first quarter of 2019 were near the long-term, first quarter norm (1988-2014). Winds were above normal across key wind power-producing areas of the Northeast United States, eastern Canada, and much of Europe. Winds were below normal across Southeast China, the United Kingdom, much of the northern High Plains and

Rocky Mountains in North America.

The recent wind speed deficit across many key wind power-producing areas of North America abated in the first quarter of 2019, although some strong deficits remain. California and the Northeast United States finished the quarter with moderately above-normal wind speeds (5% to 10%), in

Cont'd... pg 2



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part due to strong wind speed departures in February that were more than 20% above the monthly norm. Wind speeds in Eastern Canada rose well above the norm (10% to 15%). Below-normal winds continued across the Northern High Plains of North America since the previous quarter (-3% to -6%). Strong deficits of -10% to -20% were experienced across the Inland Northwest and Rocky Mountains. Above-normal wind speeds prevailed across the Yucatan Peninsula and into Central America, while a wind speed deficit continued across Central Mexico (-3% to -6%).

South America as a whole rounded out the first quarter of 2019 at near normal. Below-normal winds across key wind power producing areas of northeast Brazil and Uruguay (-6% to 0%) and were offset by moderately above-normal winds across southern Brazil, central Chile, Argentina, and the ABC islands (-3% to 3%).

Quarterly wind speeds across Europe as a whole rose above normal for the first time since the beginning of 2018. Strongly above-normal wind speeds overspread much of the Mediterranean region, with strongly above-normal wind speeds experienced throughout Italy and Greece (more than 15%) and moderately above normal (5% to 10%) wind speeds across Turkey. After much variation within the quarter, wind speeds rose to moderately above normal (4% to 8%) across Central Europe. Although the United Kingdom and France started the quarter with strong wind speed deficits, strong above-normal winds in March allowed for these areas to finish the quarter with only weak to moderate deficits (-2% to -6%).

Wind speeds rose slightly above the norm across Africa and the Middle East. Wind speeds continued to be near normal in the wind-power-producing areas of South Africa and Morocco (-5% to 5%), which represent over half the installed capacity across Africa. Wind speed departures across the Arabian Peninsula were moderately above normal (3% to 8%). Tunisia finished the quarter with wind speeds well above the norm (up to 16%), after an especially strong start to the quarter in January.

Below-normal winds persisted for another quarter across Asia. Wind speeds diminished across key wind-power-producing areas of southeast China (-6% to -10%), while above-normal departures (7% to 10%) continued in the northeast. The moderate to strong wind speed deficit across South Korea and Japan during the previous quarter abated, with near-normal to only slightly below-normal wind-speed departures in the first quarter of 2019 (-3% to 3%). Well below-normal wind speeds persisted in the Philippines (as low as -12%). Most of western India finished the quarter with above-normal wind-speed departures (3% to 6%), with the exception of Karnataka, where wind speeds were below the norm at -3% to -6%.

Wind speeds rose to near normal across Oceania. Wind speed deficits remained steady for another quarter at -9% to -3% below the quarterly norm across the southern coast of Australia. Some localized regions along the east coast of Australia experienced weak to moderate above-normal wind-speed departures (4% to 8%), while moderate to strongly above-normal winds overspread the island of Tasmania. After much variation within the quarter, most of New Zealand ended the period with near-normal wind speeds, although the North Island experienced a strong deficit as great as -15% below the norm.

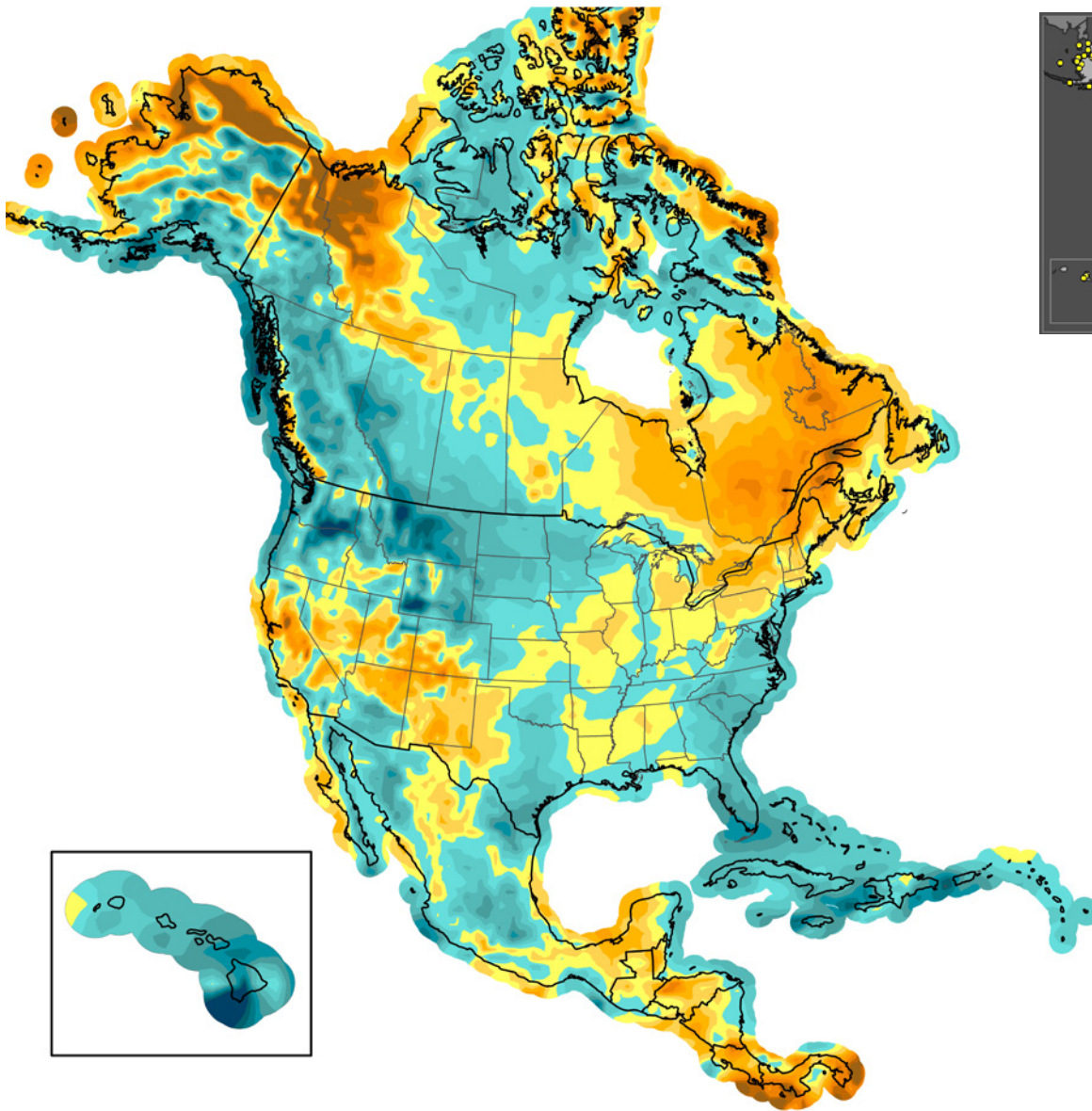


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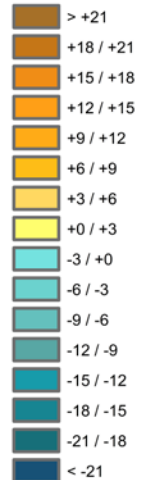
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Wind plant locations source:
www.thewindpower.net

Wind Speed Anomaly (%)



NORTH AMERICA

Q1 2019

Areas with below-average winds:

- Hawaii
- Northern High Plains, USA and Canada
- Central Mexico

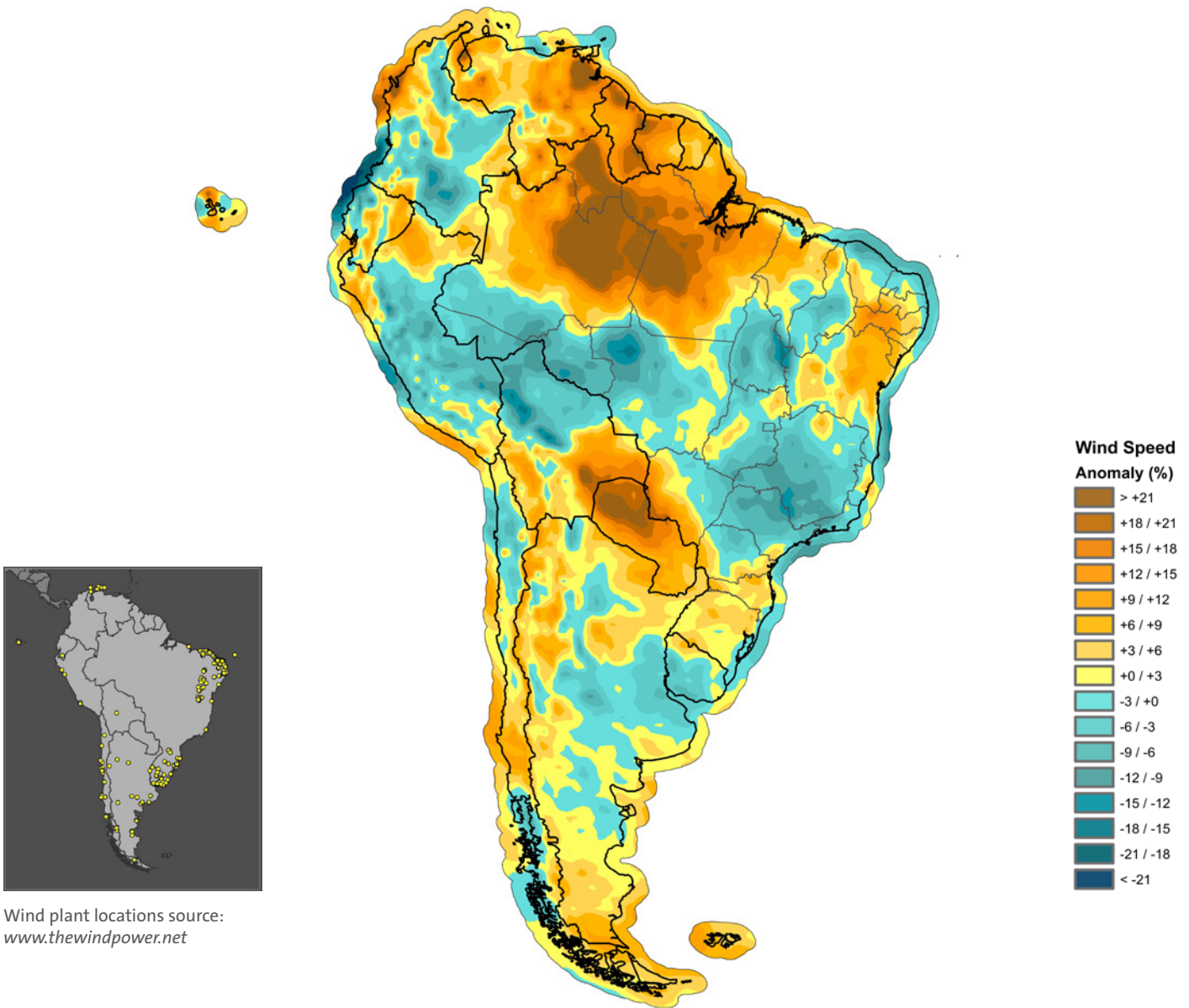
Areas with above-average winds:

- Northeast USA
- Eastern Canada
- Yucatan Peninsula
- Central America



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SOUTH AMERICA

Q1 2019

Areas with below-average winds:

- Uruguay
- Coastal Northeast Brazil
- Southeast Brazil

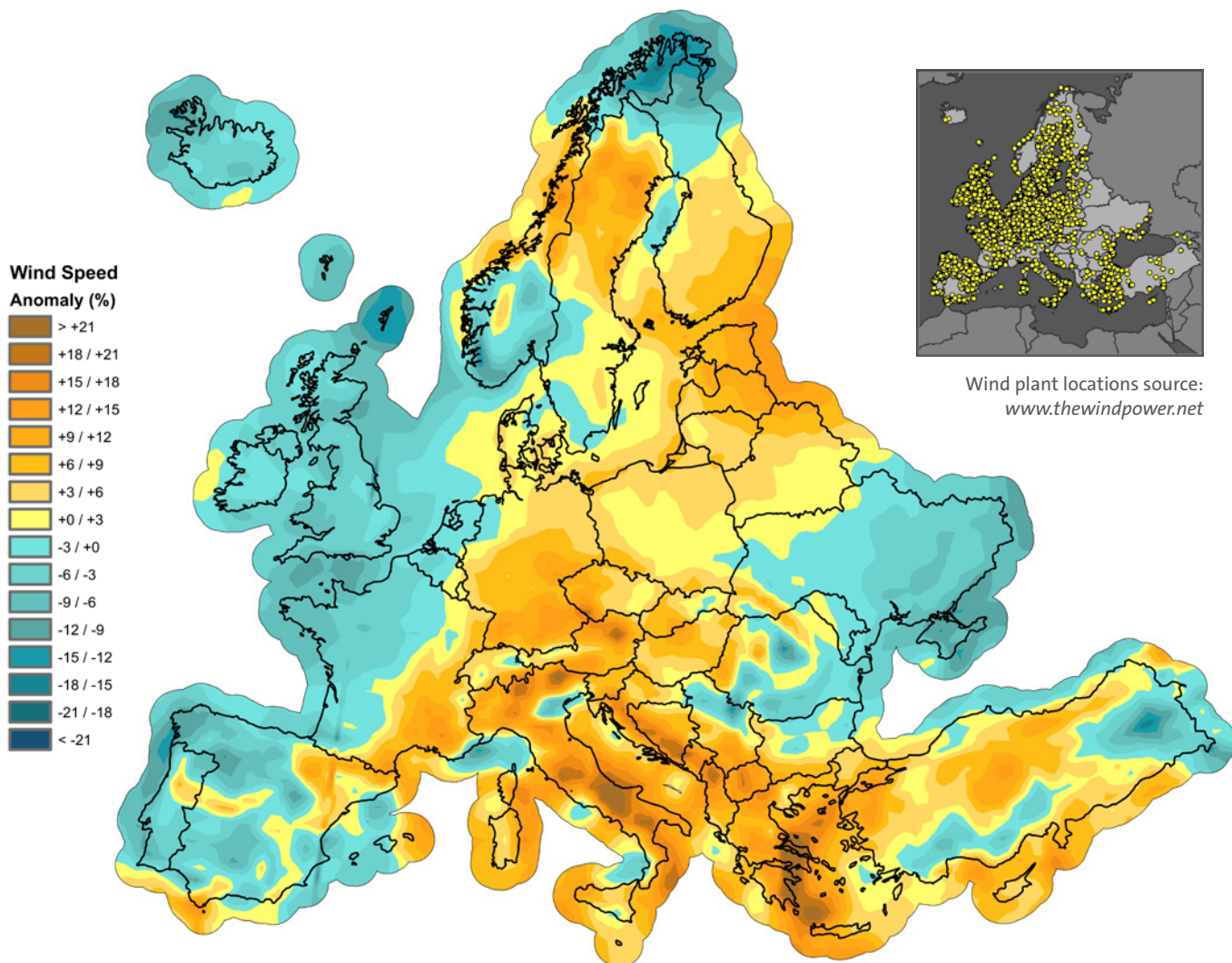
Areas with above-average winds:

- Coastal Peru
- Argentina
- Central Chile



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EUROPE

Q1 2019

Areas with below-average winds:

- United Kingdom
- Spain
- France

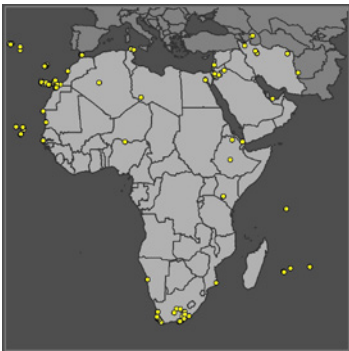
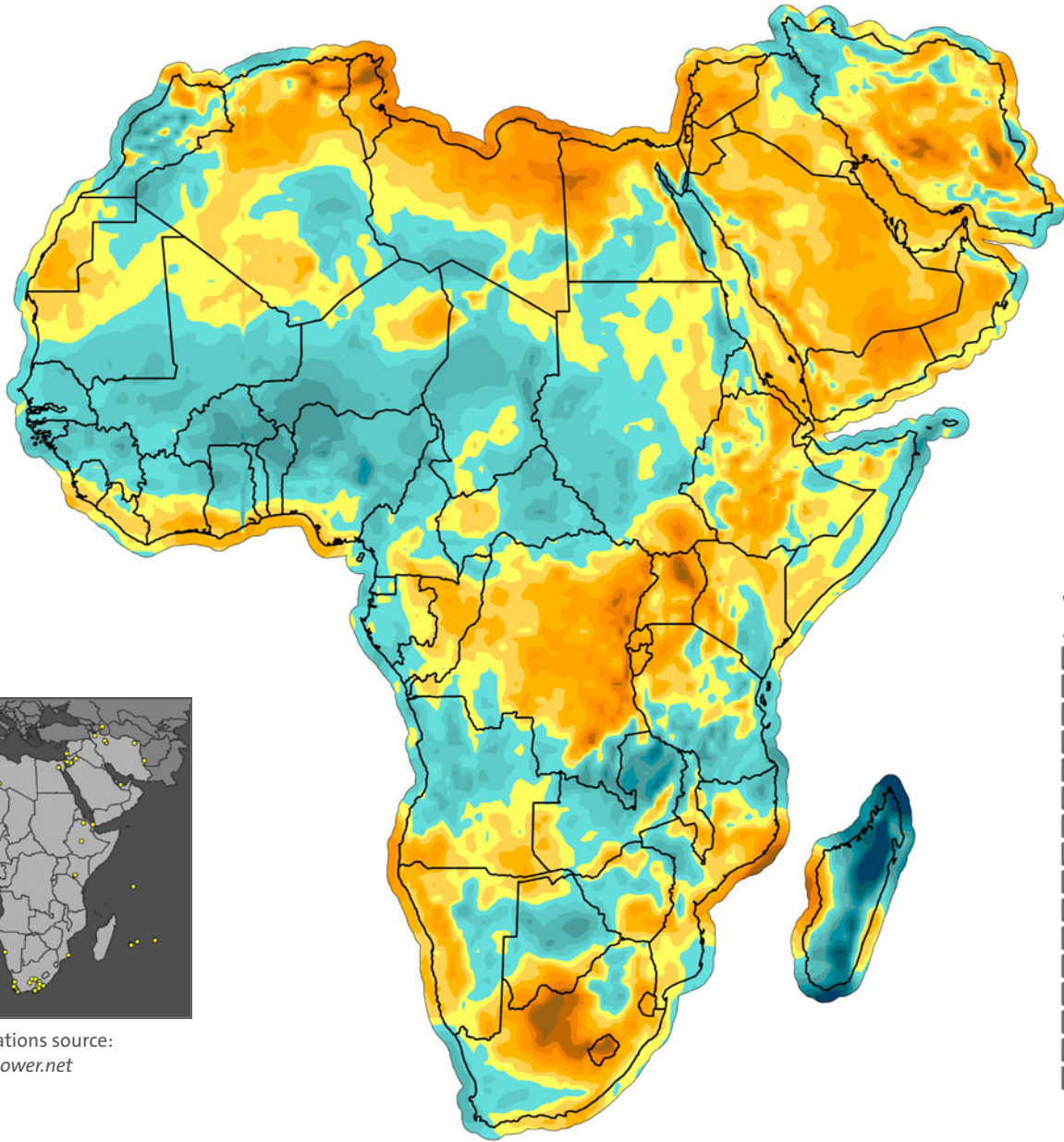
Areas with above-average winds:

- Central Europe
- Italy
- Turkey



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Wind plant locations source:
www.thewindpower.net

AFRICA / MIDDLE EAST

Q1 2019

Areas with below-average winds:

- Egypt
- Mauritius
- Reunion

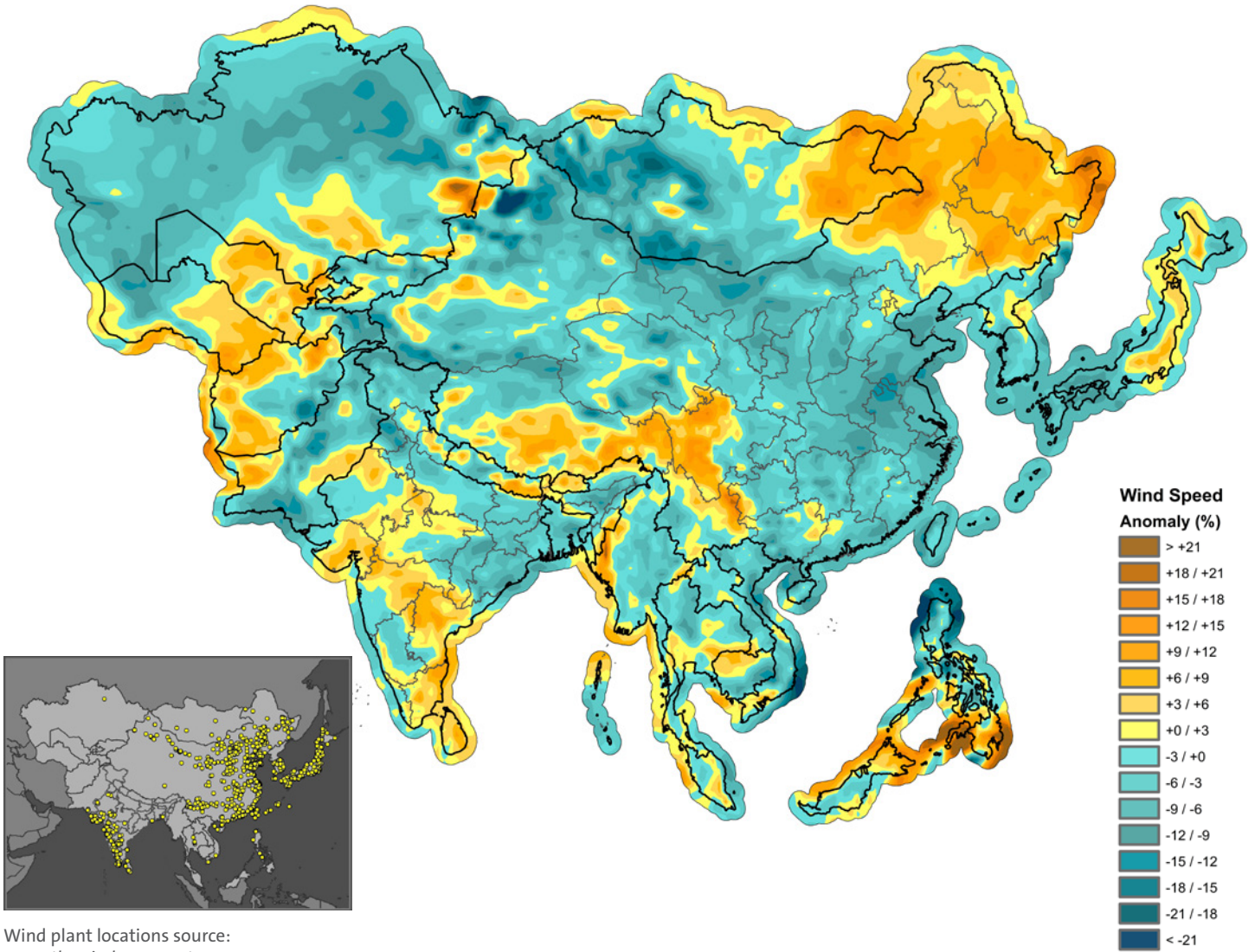
Areas with above-average winds:

- South Africa
- The Levant
- Tunisia



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Wind plant locations source:
www.thewindpower.net

ASIA

Q1 2019

Areas with below-average winds:

- Philippines
- Southeast China
- Southern Japan
- South Korea
- Pakistan

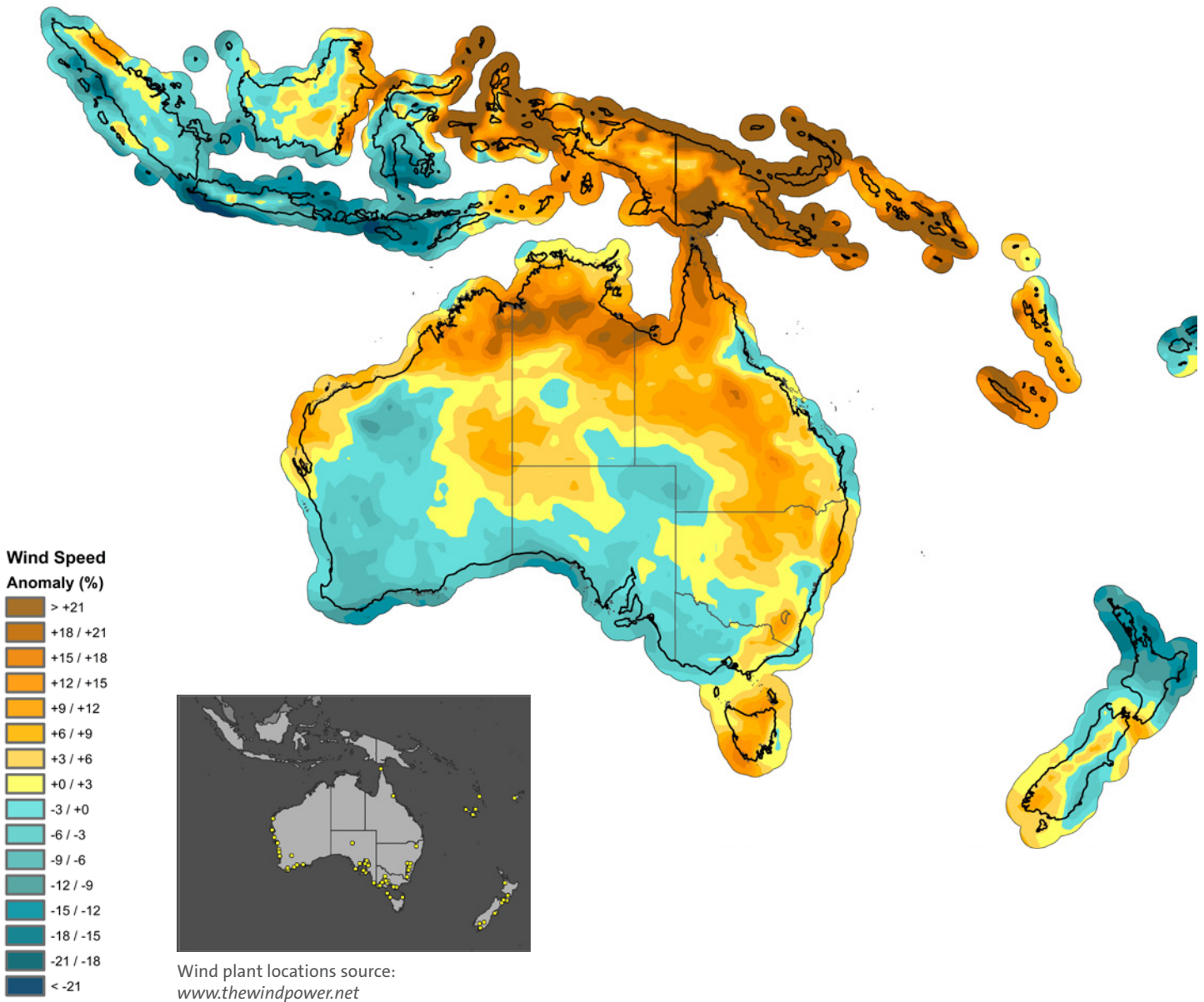
Areas with above-average winds:

- Northeast China
- Western India
- Sri Lanka



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WIND SPEED PERFORMANCE



INDONESIA, AUSTRALIA AND OCEANIA

Q1 2019

Areas with below-average winds:

- New Caledonia
- Vanuatu

Areas with above-average winds:

- Fiji



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2019 Wind Index

This index represents the average wind anomaly (expressed as a percent deviation in mean speed from the 1988-2014 baseline for the corresponding calendar period) for each region and country shown, weighted by the location and megawatt capacity of wind projects in production by the end of 2018. The wind project locations and rated capacities are from The Wind Power database (TheWindPower.net). Note that not all operating projects are in the database, and coverage in certain countries such as China is weak. However, UL believes the findings are reasonably representative of wind conditions for the industry as a whole and for the key wind-producing countries.

| Regions/Leading Wind Producing Countries | Jan | Feb | Mar | Q1 | Apr | May | Jun | Q2 | Jul | Aug | Sep | Q3 | Oct | Nov | Dec | Q4 | ANNUAL |
|--|-------|-------|------|------|------|-----|-----|----|-----|-----|-----|----|-----|-----|-----|----|--------|
| North America | -1.1 | 3.1 | -4.9 | -1.3 | -1.0 | | | | | | | | | | | | |
| Canada | 3.0 | 8.1 | 0.7 | 3.9 | 9.6 | | | | | | | | | | | | |
| USA | -1.6 | 3.2 | -6.0 | -1.8 | -2.4 | | | | | | | | | | | | |
| Mexico | -2.5 | -13.5 | 0.5 | -4.9 | 1.4 | | | | | | | | | | | | |
| South America | 8.8 | -9.2 | -3.9 | -0.9 | -6.5 | | | | | | | | | | | | |
| Brazil | 11.1 | -10.7 | -6.6 | -1.5 | -7.8 | | | | | | | | | | | | |
| Argentina | -0.7 | 5.9 | 1.2 | 2.0 | 1.7 | | | | | | | | | | | | |
| Europe | 0.1 | -4.8 | 11.0 | 1.9 | 0.6 | | | | | | | | | | | | |
| Denmark | -2.9 | -3.2 | 13.5 | 2.2 | -4.6 | | | | | | | | | | | | |
| France | -7.7 | -14.0 | 18.1 | -1.7 | -5.7 | | | | | | | | | | | | |
| Germany | 1.9 | -7.6 | 19.7 | 4.6 | 3.8 | | | | | | | | | | | | |
| Great Britain | -16.2 | -7.5 | 9.8 | -5.3 | -2.1 | | | | | | | | | | | | |
| Ireland | -22.1 | 12.9 | 4.7 | -2.8 | 12.9 | | | | | | | | | | | | |
| Italy | 17.3 | 16.4 | 6.4 | 13.2 | -4.3 | | | | | | | | | | | | |
| Portugal | 5.3 | -7.3 | -2.1 | -0.9 | 5.8 | | | | | | | | | | | | |
| Spain | 7.0 | -12.1 | -1.3 | -1.9 | 1.5 | | | | | | | | | | | | |
| Africa / Middle East | 5.7 | -3.8 | 1.2 | 1.3 | -1.5 | | | | | | | | | | | | |
| South Africa | -5.5 | -3.4 | -1.0 | 1.6 | -0.7 | | | | | | | | | | | | |
| Egypt | 8.0 | -15.1 | -3.7 | -7.8 | 2.9 | | | | | | | | | | | | |
| Asia | -4.5 | -2.8 | -3.1 | -3.5 | -4.6 | | | | | | | | | | | | |
| China | -4.9 | -4.0 | -3.7 | -4.2 | -5.1 | | | | | | | | | | | | |
| India | -4.1 | 5.7 | 0.3 | 0.3 | -1.5 | | | | | | | | | | | | |
| Ind, Aus, Oceania | -2.5 | 1.7 | -1.4 | -0.9 | 3.9 | | | | | | | | | | | | |
| Australia | -4.5 | 0.9 | 0.3 | -1.3 | 5.4 | | | | | | | | | | | | |
| World | -0.6 | -1.7 | 2.2 | -0.2 | -0.9 | | | | | | | | | | | | |

Click [HERE](#) to download index values for even more wind producing countries!

