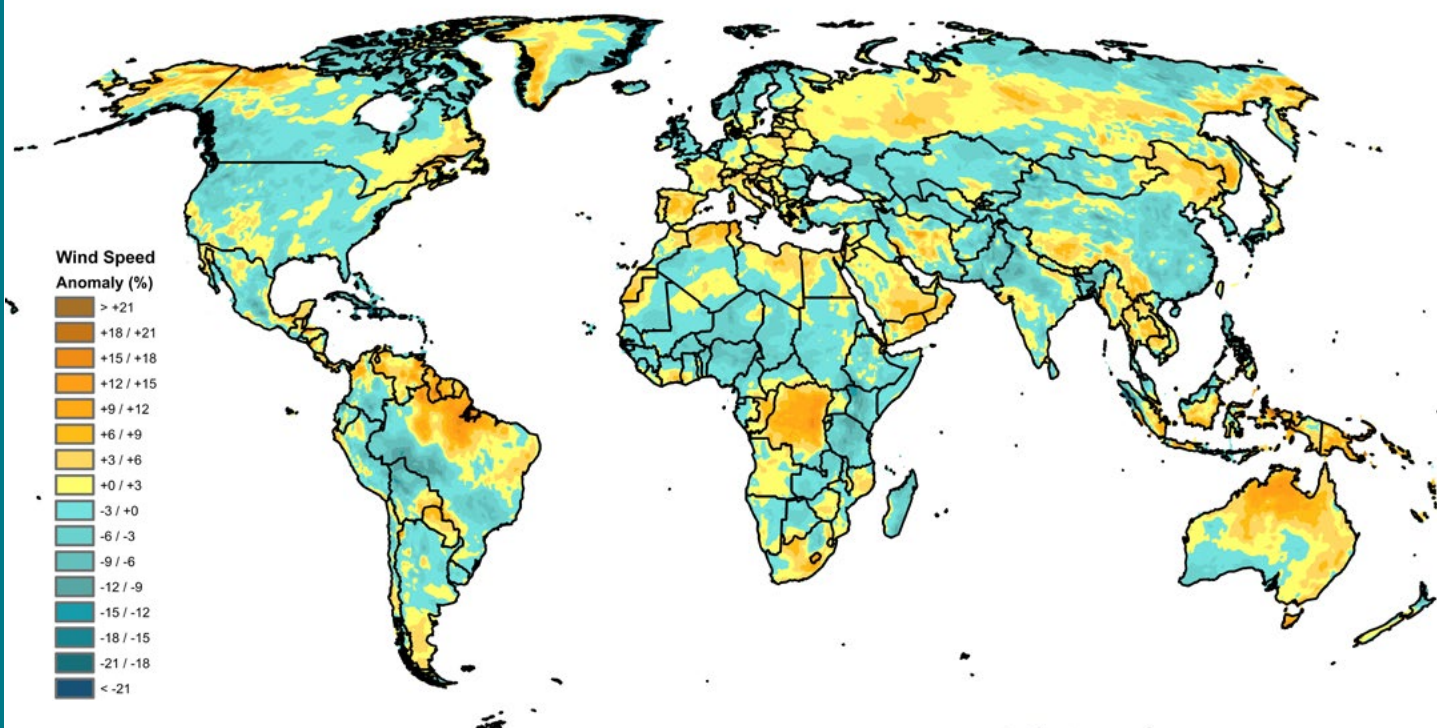


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GLOBAL

2019 Annual

According to global reanalysis data, many of the world's key wind power producing areas dipped slightly below normal in 2019. The wind speed deficit continued across much of North America. Widespread wind speed deficits spread across much of China and persisted throughout the year.

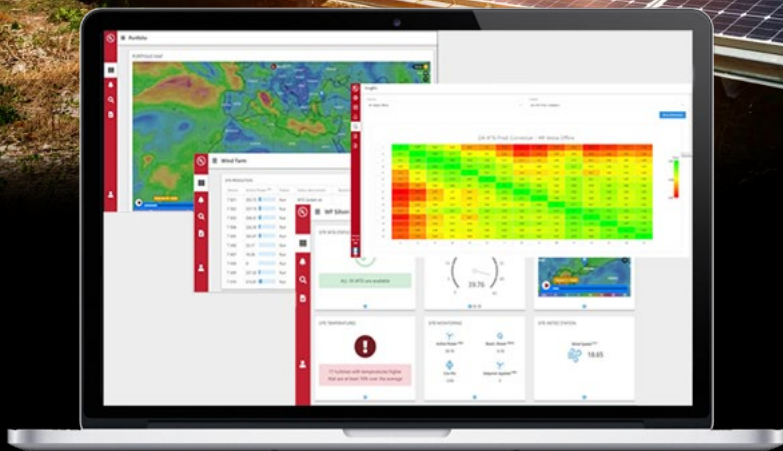
Above-normal wind speeds blanketed the Mediterranean region, from North Africa into Southern Europe. Wind speeds also rose across central Europe, reversing the pattern of deficits experienced in 2018.



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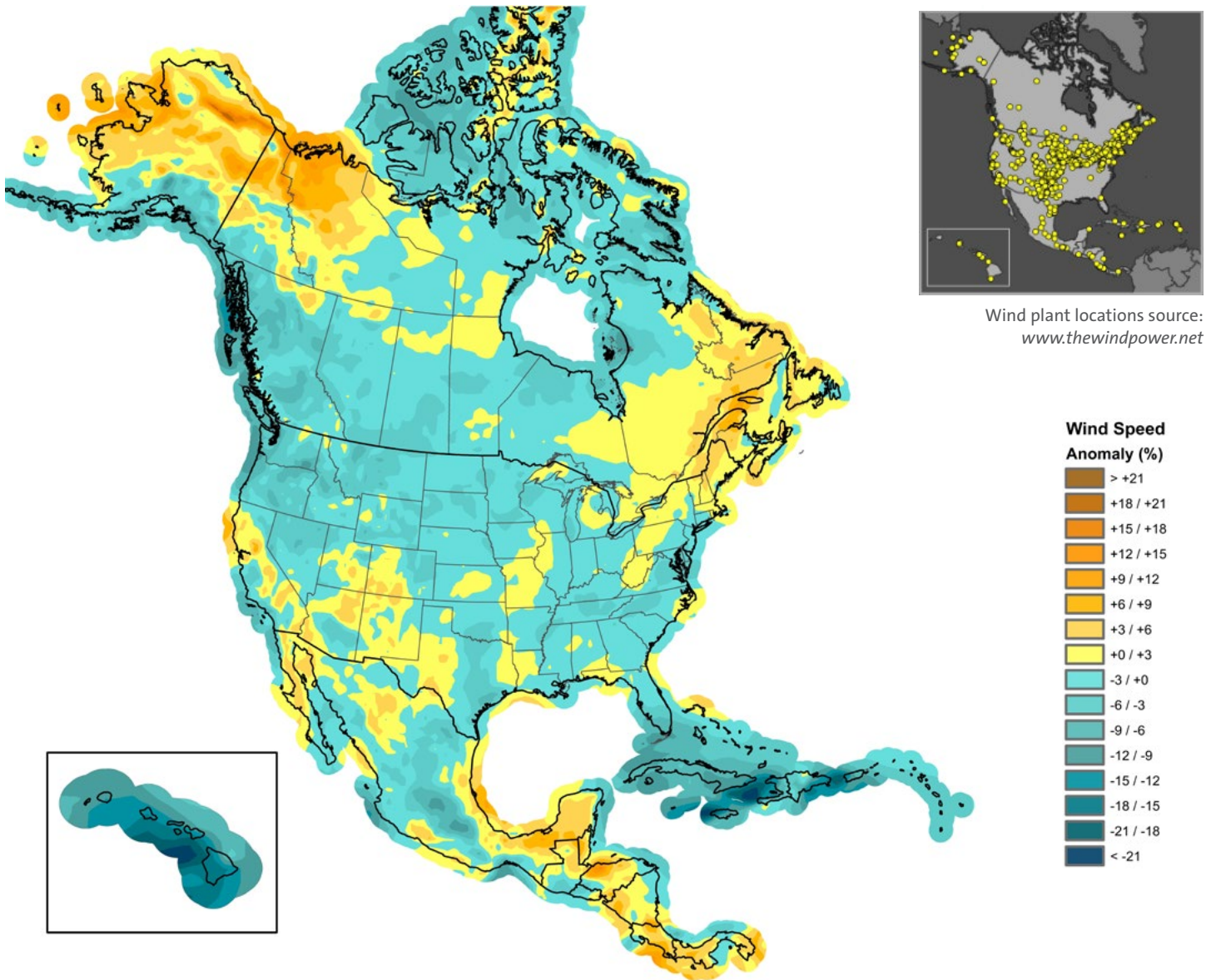
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NORTH AMERICA

Wind speed departures remained relatively unchanged for key wind power producing regions of North America. Above-normal conditions (+3% to +9%) continued across the Canadian Maritimes and Northeastern provinces during the first half of the year. Below-normal wind speeds (0% to -5%) continued across the Great Plains, eastern Texas and the Ohio River Valley. Wind speed deficits

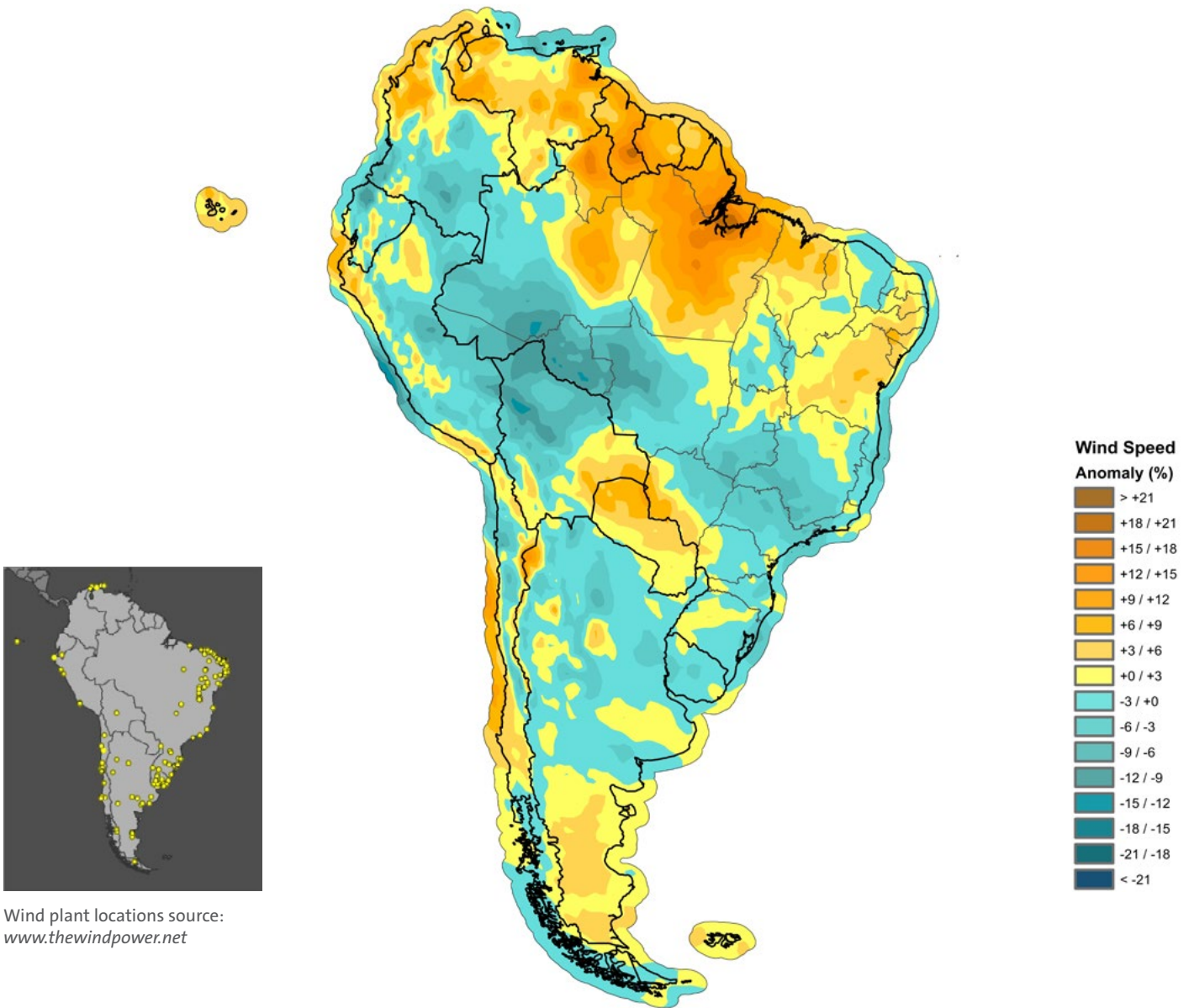
2019 Annual

dropped to -3% to -9% below the norm across the Pacific Northwest and British Columbia. Hawaiian wind speed deficits (-9% to -16%) persisted as well; a pattern that has held for several years in a row. Moderately below-normal wind speed departures continued across much of Central Mexico, which ended the year at -6% below the norm.



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SOUTH AMERICA

2019 Annual

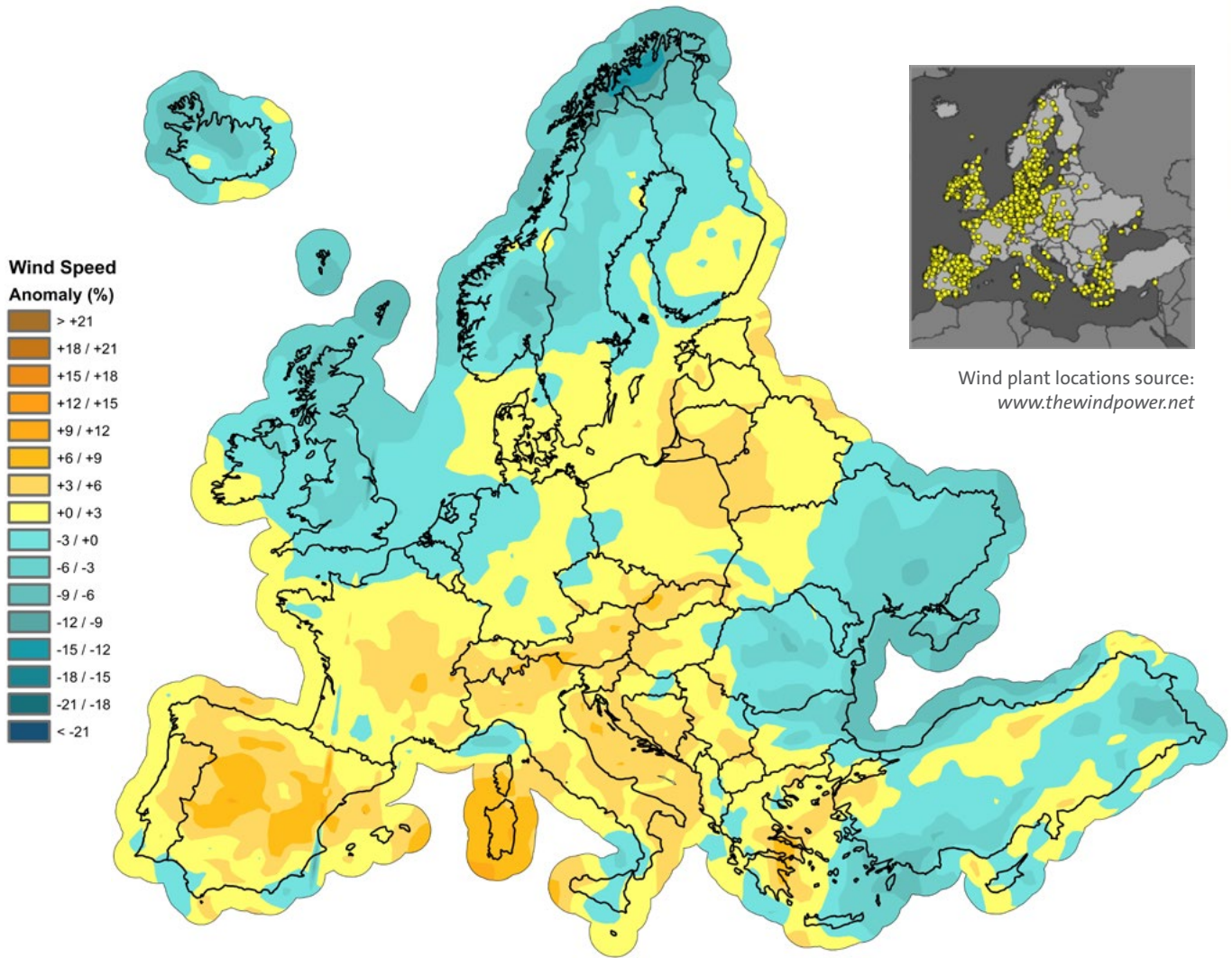
Wind speeds in northern Brazil, Venezuela, and Colombia moderated compared to the previous year, but still finished slightly above the norm (+6%). Southern Argentina experienced consistently above-normal wind speeds during 2019, while northern Argentina and Uruguay finished the year with moderately

below-normal wind speeds (0% to -3%) after variation during the year. The strong wind speed surpluses previously experienced across Central America in 2018 abated. Honduras, Nicaragua and Costa Rica finished the year with near-normal wind speeds overall (0 to 3%).



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EUROPE

Wind speeds rose above normal across much of Europe. The wind speed pattern was dominated by above-normal wind speeds (+3% to +8%) throughout the Iberian Peninsula, and the Mediterranean. Deficits of -2% to -6% were seen across the United Kingdom and northern Scandinavia. Spain and Portugal finished the year 4% above the norm, overall. Wind speed departures rose to slightly

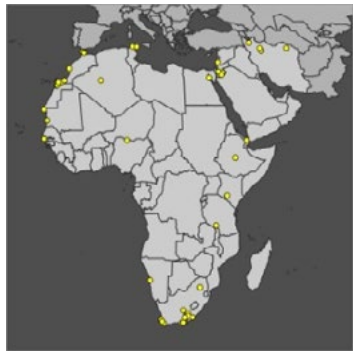
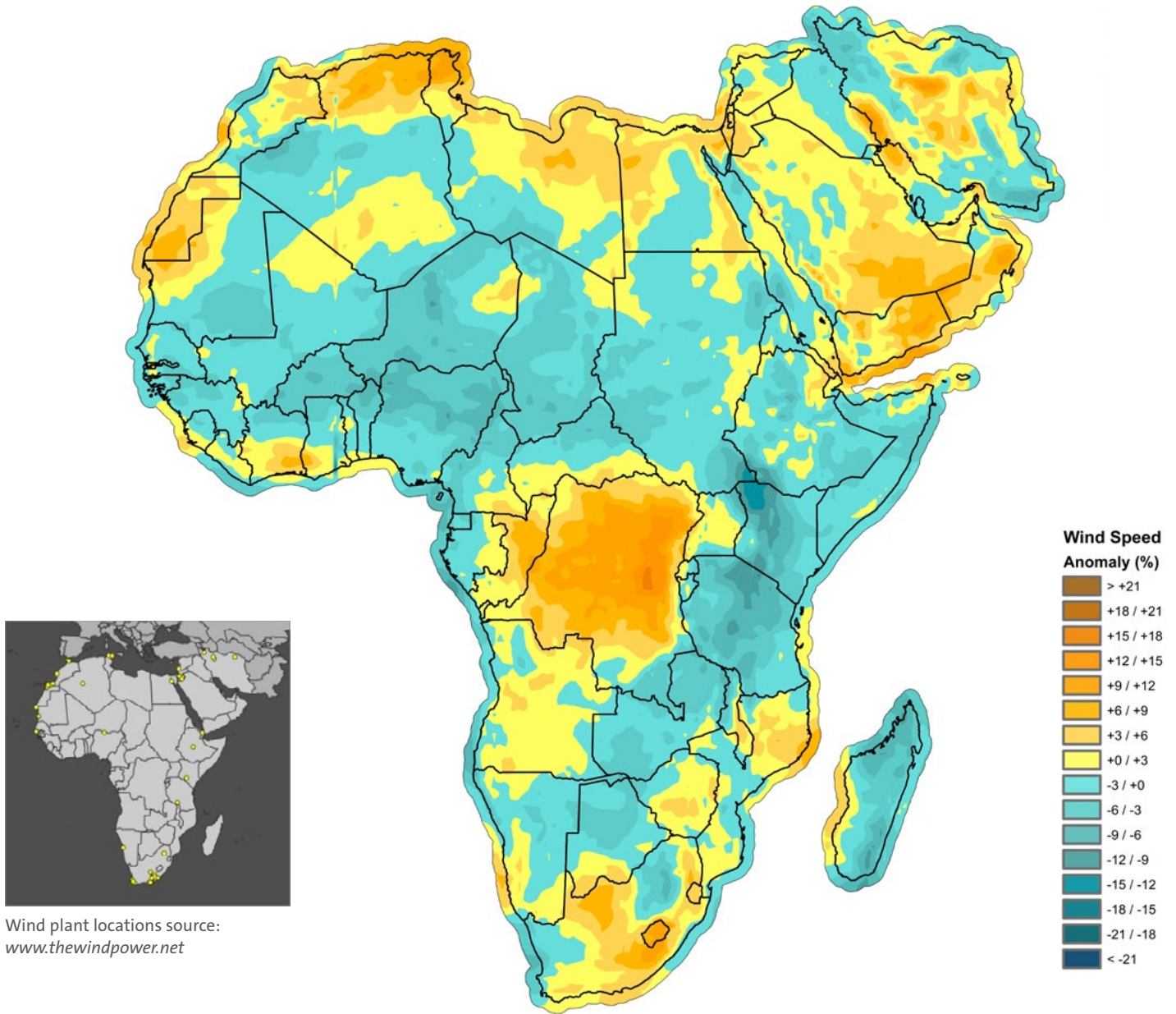
2019 Annual

above normal in Central Europe (+0% to +5%), which was a reversal from wind speed deficits during the previous year. Germany, which represents just over a quarter of the installed capacity in Europe, rounded out 2019 with near normal wind speeds (+0% departures) after much monthly variation in wind speed departures.



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Wind plant locations source:
www.thewindpower.net

AFRICA / MIDDLE EAST

2019 Annual

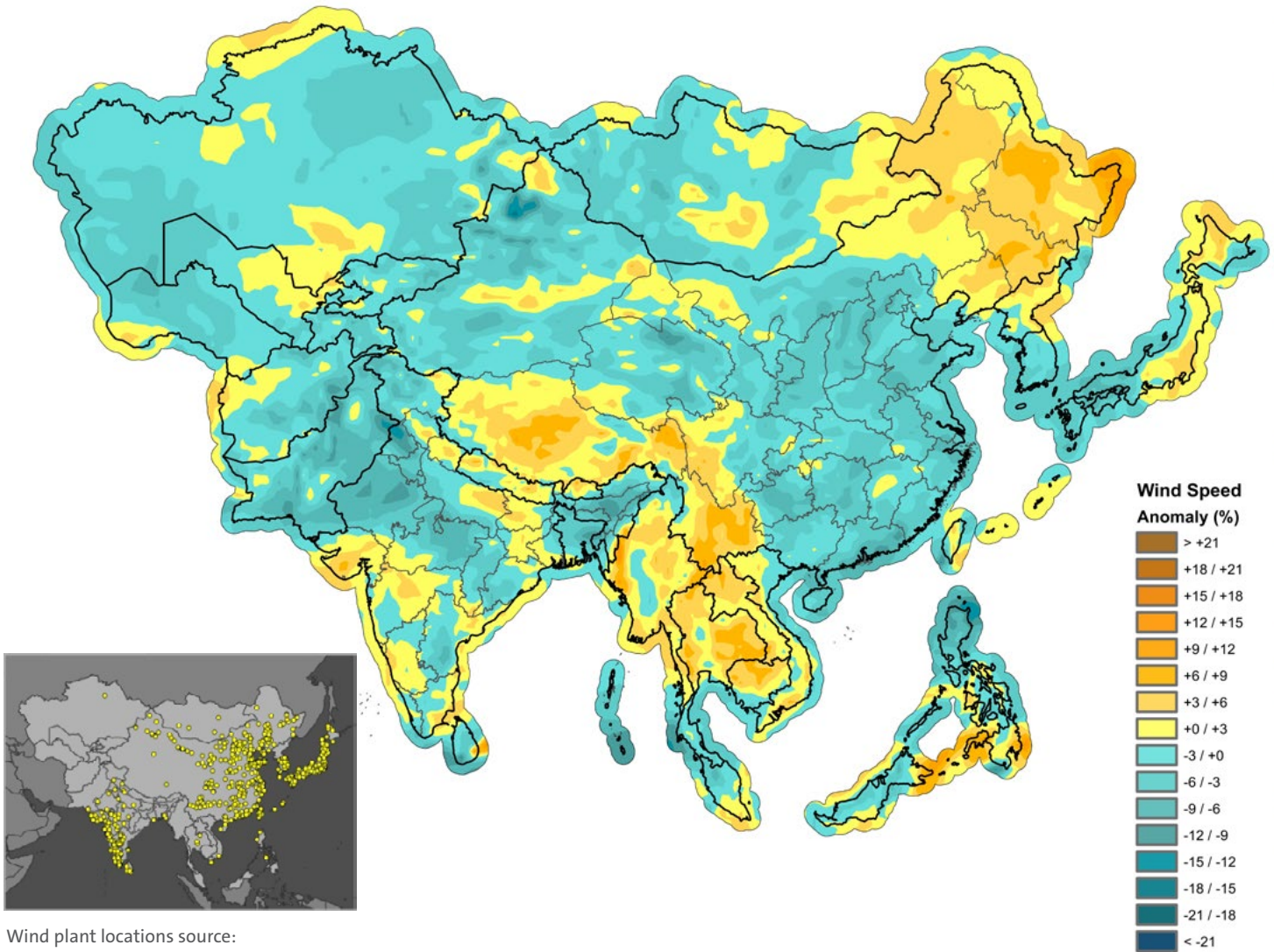
Strongly above the norm wind speed departures in North Africa during the early part of 2019 moderated slightly during the third quarter before returning in November and December. Tunisia finished the year with wind speed departures 9% above the annual mean. Winds speeds across the Arabian Peninsula stayed moderately above normal (3% to 6%) during the year. Above normal wind speeds continued

throughout much of South Africa, which finished the year 3% above the norm. Strong wind speed deficits during the fourth quarter resulted in overall below the norm annual wind speeds in Kenya, which finished the year 6% below normal. The Seychelles and Mauritius islands experienced well below-normal wind speeds with departures -7% to -13% below the norm.



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WIND SPEED PERFORMANCE



ASIA

Wind speed deficits persisted across south-central and eastern China throughout 2019, resulting in overall below normal wind speed departures of -2% to -8%. After a strong start to the year, Northeastern China finished the year with above normal wind speeds (+3% to +6%). India's key wind producing states from Gujarat to Tamil Nadu moderated to near normal wind speeds (-2% to +4%), particularly after strongly above-normal wind speed

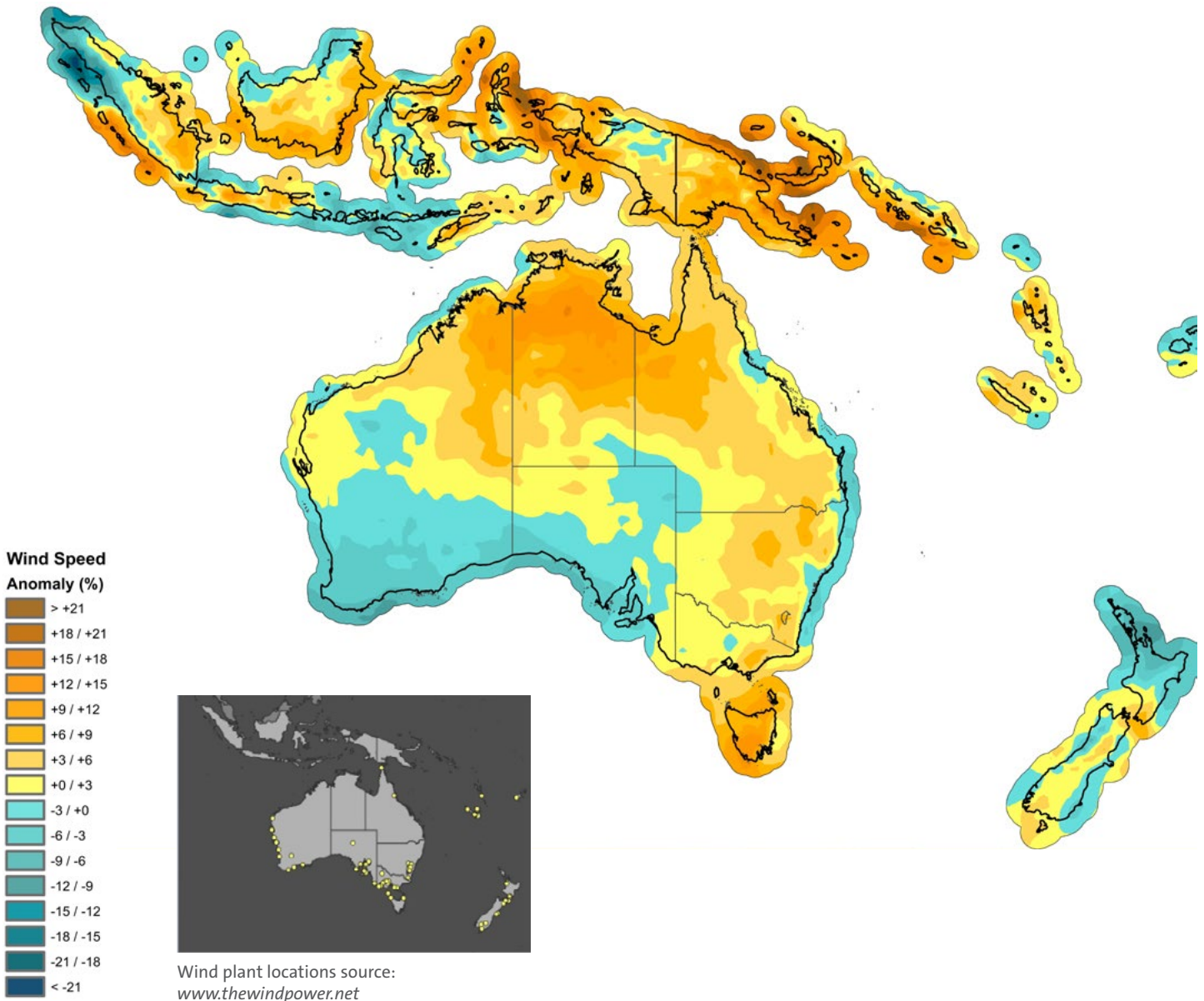
2019 Annual

departures during the third quarter of the year. In Rajasthan, India, the pattern of strong wind speed deficits starting in 2018 lingered throughout 2019, resulting in overall annual mean deficits of -6% to -9% below the mean. Wind speed deficits held across South Korea. Despite gains in the third quarter, the South Korean annual wind speed departures remained slightly below normal (-2%) for 2019.



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INDONESIA, AUSTRALIA AND OCEANIA

2019 Annual

Tasmania experienced well above-normal wind speeds throughout all of 2019 and finished the year with well above-normal annual mean wind speeds (+6% to +12%). Above-normal wind speeds also persisted across eastern Australia, which finished throughout the year slightly to moderately above the norm (+1% to +6 %).

Wind speed departures fell to -2% to -7% below the norm over Southwestern Australia. Above normal wind speeds departures (+2% to +5%) spread from New Zealand's South Island through the Cook Strait.



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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	-5.2	-4.0	-3.4	1.0	-1.3	6.3	2.0	5.3	-4.5	-4.9	-1.5	-1.1
Canada	3.0	8.1	0.7	3.9	9.6	-5.2	0.8	2.0	-2.0	-2.5	-1.1	-1.8	-3.4	0.6	0.8	-0.6	0.9
USA	-1.6	3.2	-6.0	-1.8	-2.4	-5.1	-4.8	-4.1	1.5	-0.8	7.7	2.8	7.6	-5.1	-5.6	-1.2	-1.2
Mexico	-2.5	-13.5	0.5	-4.9	1.4	-3.8	-3.5	-2.1	-5.9	-13.6	-1.2	-7.2	-18.6	-6.6	-3.9	-9.1	-6.0
South America	8.8	-9.2	-3.9	-0.9	-6.5	2.1	4.9	0.6	-1.0	3.8	-1.6	0.4	2.2	-0.4	6.4	2.6	0.7
Brazil	11.1	-10.7	-6.6	-1.5	-7.8	1.9	4.7	0.1	-2.1	3.1	0.1	0.4	2.2	0.5	8.4	3.4	0.7
Argentina	-0.7	5.9	1.2	2.0	1.7	-4.7	2.9	0.0	-4.0	4.2	12.4	4.1	3.8	5.7	-3.6	1.9	2.0
Europe	0.1	-4.8	11.0	1.9	0.6	2.1	-0.1	0.8	-3.6	-2.6	3.4	-0.9	-4.6	2.4	4.4	0.9	0.7
Denmark	-2.9	-3.2	13.5	2.2	-4.6	15.8	-1.8	3.1	7.5	-3.2	11.6	5.4	-11.3	-12.2	6.6	-5.4	0.9
France	-7.7	-14.0	18.1	-1.7	-5.7	-1.6	-0.1	-2.6	-2.5	-2.7	11.2	2.1	6.9	4.9	9.6	7.0	1.3
Germany	1.9	-7.6	19.7	4.6	3.8	1.1	-2.8	0.8	-4.8	-8.0	3.4	-3.1	0.0	-7.7	-0.8	-3.0	-0.1
Great Britain	-16.2	-7.5	9.8	-5.3	-2.1	-14.3	4.1	-4.4	-6.0	12.4	1.0	2.5	-2.0	-12.8	3.4	-3.7	-3.1
Ireland	-22.1	12.9	4.7	-2.8	12.9	-14.3	3.5	-1.2	-7.2	17.2	4.5	4.9	0.0	-7.5	3.6	-1.3	-0.6
Italy	17.3	16.4	6.4	13.2	-4.3	11.9	-7.2	0.2	-2.9	-17.3	-10.8	-10.2	-16.8	17.9	14.3	6.3	3.0
Portugal	5.3	-7.3	-2.1	-0.9	5.8	15.8	1.4	7.6	-6.2	-2.8	5.3	-1.5	-6.0	24.1	14.0	10.9	4.0
Spain	7.0	-12.1	-1.3	-1.9	1.5	9.8	3.3	4.7	0.9	-5.1	5.3	0.3	-7.3	36.2	10.6	13.5	4.2
Africa / Middle East	5.7	-3.8	1.2	1.3	-1.5	0.7	-2.1	-0.9	5.7	-2.6	0.2	1.1	2.7	5.0	4.7	4.1	1.5
South Africa	-5.5	-3.4	-1.0	1.6	-0.7	-2.8	3.0	0.0	17.4	-10.0	-1.9	1.8	4.7	1.9	13.7	6.7	2.6
Egypt	8.0	-15.1	-3.7	-7.8	2.9	2.3	-11.1	-2.4	-1.2	-14.3	9.0	-1.8	-0.4	-5.2	1.0	-1.4	-3.2
Asia	-4.5	-2.8	-3.1	-3.5	-4.6	4.3	-1.8	-0.8	-3.0	4.4	-2.7	-0.6	-0.9	0.7	-0.9	-0.4	-1.3
China	-4.9	-4.0	-3.7	-4.2	-5.1	7.2	-1.3	0.2	-4.1	4.7	-3.8	-1.2	1.0	1.6	-1.6	0.3	-1.2
India	-4.1	5.7	0.3	0.3	-1.5	-9.0	-5.4	-5.5	1.5	2.5	2.2	1.8	-12.5	-3.0	4.6	-3.6	-1.7
Ind, Aus, Oceania	-2.5	1.7	-1.4	-0.9	3.9	13.0	-6.7	3.1	5.8	2.0	-5.3	0.8	-3.1	10.7	2.2	3.0	1.5
Australia	-4.5	0.9	0.3	-1.3	5.4	13.3	-6.0	3.8	6.6	-0.3	-7.1	-0.3	-3.8	12.1	1.2	2.9	1.3
World	-0.6	-1.7	2.2	-0.2	-0.9	0.4	-1.1	-0.5	-1.4	-0.4	2.1	0.9	-1.7	-5.6	-3.0	-3.4	-0.7

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

