

A Summary of Historical Weather Conditions at 2013-2014 PGA Tour Events

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The weather plays a significant role in the performance of professional golfers. It also has a significant impact on the safety and comfort of not only the golfers, but the spectators, volunteers, caddies, tournament officials, vendors, and media personnel situated throughout the course. Particular weather events, such as thunderstorms, heavy rain, high wind, fog, frost, and even snow, can have adverse effects on tournament operations and course conditions, resulting in postponement of play or cancelation of a round or tournament. Recent examples are highlighted [here](#).

In this study, we examined the historical weather conditions for tournaments associated with the 2013-2014 season of the flagship tour of the Professional Golfers Association (or PGA Tour). We included all regular weekly tour events, playoff events, the Masters, and several invitation-only events, including the World Golf Championships (WGC). Only events conducted in the U.S. were examined.

The 2013-2014 PGA Tour season can be divided into seven “swings”, beginning with the fall series in October and ending with the playoffs the following September. Three of the playoff events this season take place on the East Coast, while the other event takes place near Denver, CO. The other swings to the PGA Tour season are generally clustered geographically, with some exceptions (e.g. the Reno-Tahoe Open near Reno, NV, which is during the Midwest-East Coast summer swing). Below is a map and table of the tournaments examined in this study.

2013-2014 PGA Tour Events

*U.S. Events Only



Fall Series Hawaii Swing West Coast Swing Florida Swing Southern Swing Summer Swing Playoffs

Event	Event Number	Dates	Course	Location
Frys.com Open	1	October 10-13	CordeValle GC	San Martin, CA
Shriners Hospital Open	2	October 17-20	TPC Summerlin	Las Vegas, NV
The McGladrey Classic	3	November 7-10	Sea Island Resort Seaside	St. Simons Island, GA
Hyundai Tournament of Champions	4	January 3-6	Kapalua Plantation	Kapalua, HI
Sony Open in Hawaii	5	January 9-12	Waialae CC	Honolulu, HI
Humana Challenge	6	January 16-19	Multiple Courses	La Quinta, CA
Farmers Insurance Open	7	January 23-26	Torrey Pines North & South	La Jolla, CA
Waste Management Phoenix Open	8	January 30-February 2	TPC Scottsdale	Scottsdale, AZ
AT&T Pebble Beach Pro-Am	9	February 6-9	Multiple Courses	Pebble Beach, CA
Northern Trust Open	10	February 13-16	Riviera CC	Pacific Palisades, CA
WGC Accenture Match Play	11	February 20-23	Dove Mountain Resort	Marana, AZ
Honda Classic	12	February 27-March 2	PGA National	Palm Beach Gardens, FL
WGC Cadillac Championship	13	March 6-9	TPC Blue Monster	Doral, FL
Puerto Rico Open	14	March 6-9	Trump International GC	Rio Grande, PR
Valspar Championship	15	March 13-16	Innisbrook Copperhead	Palm Harbor, FL
Arnold Palmer Invitational	16	March 20-23	Bay Hill GC	Orlando, FL
Valero Texas Open	17	March 27-30	TPC San Antonio	San Antonio, TX
Shell Houston Open	18	April 3-6	Redstone GC	Humble, TX
The Masters	19	April 10-13	Augusta National GC	Augusta, GA
RBC Heritage	20	April 17-20	Harbour Town Golf Links	Hilton Head Island, SC
Zurich Classic of New Orleans	21	April 24-27	TPC Louisiana	New Orleans, LA
Wells Fargo Championship	22	May 1-4	Quail Hollow CC	Charlotte, NC
The Players Championship	23	May 8-11	TPC Sawgrass	Ponte Vedra Beach, FL
Byron Nelson Championship	24	May 15-18	TPC Four Seasons Las Colinas	Irving, TX
Crowne Plaza Invitational at Colonial	25	May 22-25	Colonial CC	Fort Worth, TX
The Memorial	26	May 29-June 1	Muirfield Village GC	Dublin, OH
FedEx St. Jude Classic	27	June 5-8	TPC Southwind	Memphis, TN
Travelers Championship	28	June 19-22	TPC River Highlands	Cromwell, CT
AT&T National	29	June 26-29	Congressional CC	Bethesda, MD
Greenbrier Classic	30	July 3-6	Old White TPC	White Sulphur Springs, WV
John Deere Classic	31	July 10-13	TPC Deer Run	Silvis, IL
WGC Bridgestone Invitational	32	July 31-August 3	Firestone CC	Akron, OH
Reno-Taho Open	33	July 31-August 3	Montreux Golf & CC	Reno, NV
Wyndham Championship	34	August 14-17	Sedgefield CC	Greensboro, NC
The Barclays	35	August 21-24	Ridgewood CC	Paramus, NJ
Deutsche Bank Championship	36	August 29-September 1	TPC Boston	Norton, MA
BMW Championship	37	September 4-7	Cherry Hills CC	Cherry Hills Village, CO
Tour Championship	38	September 11-14	East Lake GC	Atlanta, GA

A number of parameters were examined to characterize the predominant weather conditions associated with the 38 tournaments listed above. Historical daily temperature (°F), precipitation (inches), and snowfall (inches) for each of the four calendar days associated with each tournament were obtained from the closest official weather station maintained by the National Weather Service. All of the daily stations used in this study have periods of record longer than 50 years, while about half of the stations have at least than 74 years of data. Historical hourly dew point (°F), apparent temperature (i.e. heat index, °F), present weather, and wind speed (mph) were obtained from the closest automated weather station maintained by the Federal Aviation Administration. Only those hours during which players would be on the course were considered (7:00am to 7:00pm local time). About three-quarters of the automated stations used in this study have 60 to 65-year records, while seven of the stations have records of less than 20 years. A list of all the stations used in this study and their periods of record can be found [here](#). In addition, we examined the relative risk from lightning strikes and tropical cyclones using published data from the National Lightning Detection Network and National Hurricane Center, respectively.

The table below lists all 38 tournaments in chronological order and their relative ranking for a number of different weather parameters. The values associated with these rankings can be found [here](#). The five highest and lowest ranked events for each parameter are also highlighted to determine those tournaments with the most climatologically extreme weather conditions.

Event	Event Number	Dates	Course	Location	Avg Mean Temp	Avg Max Temp	Max Temp	% of Days with Max Temp	Avg Min Temp	Min Temp	% of Days with Min Temp <32 degF	Avg Hourly Heat Index	Max Hourly Heat Index	Avg Mean Dew Point	Max Hourly Dew Point	Min Hourly Dew Point	% of Days with Measurable PPT	Daily Max PPT	Greatest Tournament (4-day) Total	Avg Hourly Wind Speed	Max Hourly Wind Speed	Max Peak Wind Speed
Frys.com Open	1	October 10-13	CordeValle GC	San Martin, CA	30	30	15	19	29	28		31	27	29	29	27	33	15	12	33	17	11
Shriners Hospital Open	2	October 17-20	TPC Summerlin	Las Vegas, NV	22	17	19	14	24	20		32	30	36	33	33	37	34	35	11	3	
The McGladrey Classic	3	November 7-10	Sea Island Resort Seaside	St. Simons Island, GA	32	32	36		34	34	6	30	29	27	21	28	30	28	30	30	28	21
Hyundai Tournament of Champions	4	January 3-6	Kapalua Plantation	Kapalua, HI	13	16	32		11	4		21	31	8	20	18	11	7	17	1	3	5
Sony Open in Hawaii	5	January 9-12	Waialae CC	Honolulu, HI	11	18	33		6	2		22	32	7	22	2	12	17	13	14	38	36
Humana Challenge	6	January 16-19	Multiple Courses	La Quinta, CA	34	33	16	24	36	37	3	33	33	35	37	35	36	35	28	38	18	36
Farmers Insurance Open	7	January 23-26	Torrey Pines North & South	La Jolla, CA	33	36	38		31	24		36	36	31	32	32	17	25	18	34	29	37
Waste Management Phoenix Open	8	January 30-February 2	TPC Scottsdale	Scottsdale, AZ	36	35	34		37	36	2	37	37	38	38	35	34	37	37	24	20	
AT&T Pebble Beach Pro-Am	9	February 6-9	Multiple Courses	Pebble Beach, CA	38	38	37		35	35	5	35	38	32	36	25	6	26	16	36	30	33
Northern Trust Open	10	February 13-16	Riviera CC	Pacific Palisades, CA	35	37	35		33	30	7	34	34	30	30	36	29	13	8	24	4	17
WGC Accenture Match Play	11	February 20-23	Dove Mountain Resort	Marana, AZ	37	34	24	25	38	38	1	38	35	38	35	37	34	36	36	27	14	32
Honda Classic	12	February 27-March 2	PGA National	Palm Beach Gardens, FL	20	25	23	26	19	31	8	19	16	19	13	23	26	9	10	4	15	19
WGC Cadillac Championship	13	March 6-9	TPC Blue Monster	Doral, FL	16	21	31		15	17		17	17	17	18	21	23	20	23	5	12	31
Puerto Rico Open	14	March 6-9	Trump International GC	Rio Grande, PR	2	9	20	20	1	1		8	19	1	17	1	1	16	32	7	31	34
Valspar Championship	15	March 13-16	Innisbrook Copperhead	Palm Harbor, FL	23	26	25	27	20	25		23	25	20	24	24	24	14	7	12	2	6
Arnold Palmer Invitational	16	March 20-23	Bay Hill GC	Orlando, FL	25	24	26	22	23	26		20	13	22	12	19	18	6	15	10	32	8
Valero Texas Open	17	March 27-30	TPC San Antonio	San Antonio, TX	29	27	3	17	26	32	6	28	20	26	27	29	19	29	35	11	5	25
Shell Houston Open	18	April 3-6	Redstone GC	Humble, TX	26	29	27	28	21	21		26	24	23	19	22	21	18	29	8	6	26
The Masters	19	April 10-13	Augusta National GC	Augusta, GA	31	31	28	29	32	33	4	29	26	28	28	31	15	31	26	22	25	27
RBC Heritage	20	April 17-20	Harbour Town Golf Links	Hilton Head Island, SC	27	19	17	18	27	27		25	21	25	26	26	32	11	19	16	19	12
Zurich Classic of New Orleans	21	April 24-27	TPC Louisiana	New Orleans, LA	14	15	29	30	13	18		16	18	10	5	14	22	1	1	9	20	23
Wells Fargo Championship	22	May 1-4	Quail Hollow CC	Charlotte, NC	28	28	21	21	25	29	9	27	22	24	23	20	7	10	14	19	35	35
The Players Championship	23	May 8-11	TPC Sawgrass	Ponte Vedra Beach, FL	9	7	10	9	14	13		7	12	12	10	15	27	22	24	13	21	15
Byron Nelson Championship	24	May 15-18	TPC Four Seasons Las Colinas	Irving, TX	7	8	13	8	8	14		6	3	14	4	9	28	3	4	3	13	18
Crowne Plaza Invitational at Colonial	25	May 22-25	Colonial CC	Fort Worth, TX	4	4	6	4	4	5		3	10	3	7	10	16	12	6	2	16	7
The Memorial	26	May 29-June 1	Muirfield Village GC	Dublin, OH	24	23	22	16	22	22		15	14	21	16	17	4	27	20	20	26	14
FedEx St. Jude Classic	27	June 5-8	TPC Southwind	Memphis, TN	3	2	4	3	3	7		1	5	4	3	5	20	23	11	18	27	28
Travelers Championship	28	June 19-22	TPC River Highlands	Cromwell, CT	18	14	7	10	18	15		11	7	18	14	11	3	32	31	23	22	24
AT&T National	29	June 26-29	Congressional CC	Bethesda, MD	1	3	1	2	2	3		2	2	6	2	4	8	5	9	17	7	9
Greenbrier Classic	30	July 3-6	Old White TPC	White Sulphur Springs, WV	19	20	30	23	17	16		18	23	13	25	8	2	24	27	32	33	29
John Deere Classic	31	July 10-13	TPC Deer Run	Silvis, IL	6	6	5	5	10	12		5	1	5	1	7	9	4	2	21	36	1
WGC Bridgestone Invitational	32	July 31-August 3	Firestone CC	Akron, OH	12	12	18	12	16	11		13	8	11	9	6	13	19	21	28	34	30
Reno-Taho Open	33	July 31-August 3	Montreux Golf & CC	Reno, NV	15	1	2	1	30	23		14	15	34	31	30	38	38	38	29	8	4
Wyndham Championship	34	August 14-17	Sedgefield CC	Greensboro, NC	5	5	8	6	5	8		4	4	2	6	3	5	8	5	31	9	22
The Barclays	35	August 21-24	Ridgewood CC	Paramus, NJ	10	13	11	11	9	6		12	6	15	8	12	10	2	3	15	23	13
Deutsche Bank Championship	36	August 29-September 1	TPC Boston	Norton, MA	17	22	9	15	12	10		10	9	16	11	16	14	21	25	6	1	2
BMW Championship	37	September 4-7	Cherry Hills CC	Cherry Hills Village, CO	21	11	12	7	28	19		24	28	33	34	34	31	33	33	25	10	10
Tour Championship	38	September 11-14	East Lake GC	Atlanta, GA	8	10	14	13	7	9		9	11	9	15	13	25	30	22	26	37	16

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Warmest Tournaments

Highest Average Mean Temperature

AT&T National	78.0
Puerto Rico Open	77.6
FedEx St. Jude Classic	77.6
Crowne Plaza Invitational	76.9
Wyndham Championship	76.6

Highest Average Maximum Temperature

Reno-Tahoe Open	92.2
FedEx St. Jude Classic	87.5
AT&T National	87.4
Crowne Plaza Invitational	86.5
Wyndham Championship	86.3

Highest Maximum Temperature

AT&T National	104
Reno-Tahoe Open	103
FedEx St. Jude Classic	100
John Deere Classic	100
Valero Texas Open	100

Percentage of Tournament Days ≥ 90

Reno-Tahoe Open	74.3
AT&T National	41.5
FedEx St. Jude Classic	36.3
Crowne Plaza Invitational	36.0
John Deere Classic	31.0

Highest Average Minimum Temperature

Puerto Rico Open	71.2
AT&T National	68.6
FedEx St. Jude Classic	67.7
Crowne Plaza Invitational	67.2
Wyndham Championship	66.9

Coldest Tournaments

Lowest Average Mean Temperature

AT&T Pebble Beach Pro-Am	52.9
WGC Accenture Match Play	54.7
Phoenix Open	55.0
Northern Trust Open	56.7
Humana Challenge	56.7

Lowest Average Minimum Temperature

WGC Accenture Match Play	40.8
Phoenix Open	42.3
Humana Challenge	42.6
AT&T Pebble Beach Pro-Am	44.5
McGladrey Classic	46.7

Lowest Minimum Temperature

WGC Accenture Match Play	20
Humana Challenge	23
Phoenix Open	24
AT&T Pebble Beach Pro-Am	26
McGladrey Classic	26

*Percentage of Tournament Days ≤ 32 **

WGC Accenture Match Play	9.8
Phoenix Open	8.5
Humana Challenge	7.0
McGladrey Classic	6.0
The Masters	2.8

Lowest Average Maximum Temperature

AT&T Pebble Beach Pro-Am	61.3
Northern Trust Open	65.1
Farmers Insurance Open	65.3
Phoenix Open	67.7
WGC Accenture Match Play	68.6

*Other tournaments at risk of a freeze or frost (minimum temperature < 35): **Valero Texas Open, Honda Classic, Northern Trust Open, Wells Fargo Championship, RBC Heritage, Frys.com Open**

Sultriest Tournaments

Highest Average Apparent Temperature (AT)

FedEx St. Jude Classic	86.1
AT&T National	85.8
Crowne Plaza Invitational	85.3
Wyndham Championship	85.2
John Deere Classic	84.9

Maximum Apparent Temperature (AT)

John Deere Classic	122
AT&T National	114
Byron Nelson Championship	110
Wyndham Championship	108
FedEx St. Jude Classic	107

Wettest Tournaments

Highest Percentage of Tournament Days with Measurable Precipitation

Puerto Rico Open	47.0
Greenbrier Classic	44.0
Travelers Championship	39.8
The Memorial	38.5
Wyndham Championship	36.8

Highest Percentage of Tournament Days with ≥ 0.5 inches of Precipitation

Puerto Rico Open	12.5
Wyndham Championship	10.0
John Deere Classic	9.8
Byron Nelson Championship	9.8
Zurich Classic of New Orleans	9.5

Highest Percentage of Tournament Days with ≥ 1.0 inches of Precipitation

Wyndham Championship	6.5
Byron Nelson Championship	4.8
Zurich Classic of New Orleans	4.8
Puerto Rico Open	3.5
The Barclays	3.4

Highest Daily Maximum Precipitation Total

Zurich Classic of New Orleans	7.67
The Barclays	6.03
Byron Nelson Championship	5.14
John Deere Classic	5.08
AT&T National	4.22

Highest Tournament (4-Day) Precipitation Total

Zurich Classic of New Orleans	7.68
John Deere Classic	7.12
The Barclays	6.57
Byron Nelson Championship	6.53
Wyndham Championship	6.05

Driest Tournaments

Lowest Percentage of Tournament Days with Measurable Precipitation

Reno-Tahoe Open	8.0
Humana Challenge	8.5
Shriners Hospital Open	8.5
Phoenix Open	10.3
WGC Accenture Match Play	10.5

Lowest Daily Maximum Precipitation

Reno-Tahoe Open	0.63
Shriners Hospital Open	0.94
WGC Accenture Match Play	0.98
Humana Challenge	1.16
Phoenix Open	1.18

Lowest Tournament (4-Day) Precipitation Total

Reno-Tahoe Open	0.82
Phoenix Open	1.18
WGC Accenture Match Play	1.33
Valero Texas Open	1.34
Shriners Hospital Open	1.42

Windiest and Calmest Tournaments

Highest Average Hourly Wind Speed

Tournament of Champions	13.2
Crowne Plaza Invitational	13.0
Byron Nelson Championship	12.6
Honda Classic	12.2
WGC Cadillac Championship	12.2

Highest Maximum Peak Wind Gust

John Deere Classic	65.6
Deutsche Bank Championship	63.3*
Shriners Hospital Open	55.2
Reno-Tahoe Open	48.3
Tournament of Champions	47.2

Lowest Average Hourly Wind Speed

Humana Challenge	5.1
Phoenix Open	6.1
AT&T Pebble Beach Pro-Am	6.2
Shriners Hospital Open	7.1
Farmers Insurance Open	7.1

*Hurricane Isaac (August 2011)

Snowiest Tournaments

Percentage of Years in Which a Trace of Snow Accumulated During the Month(s) of the Tournament

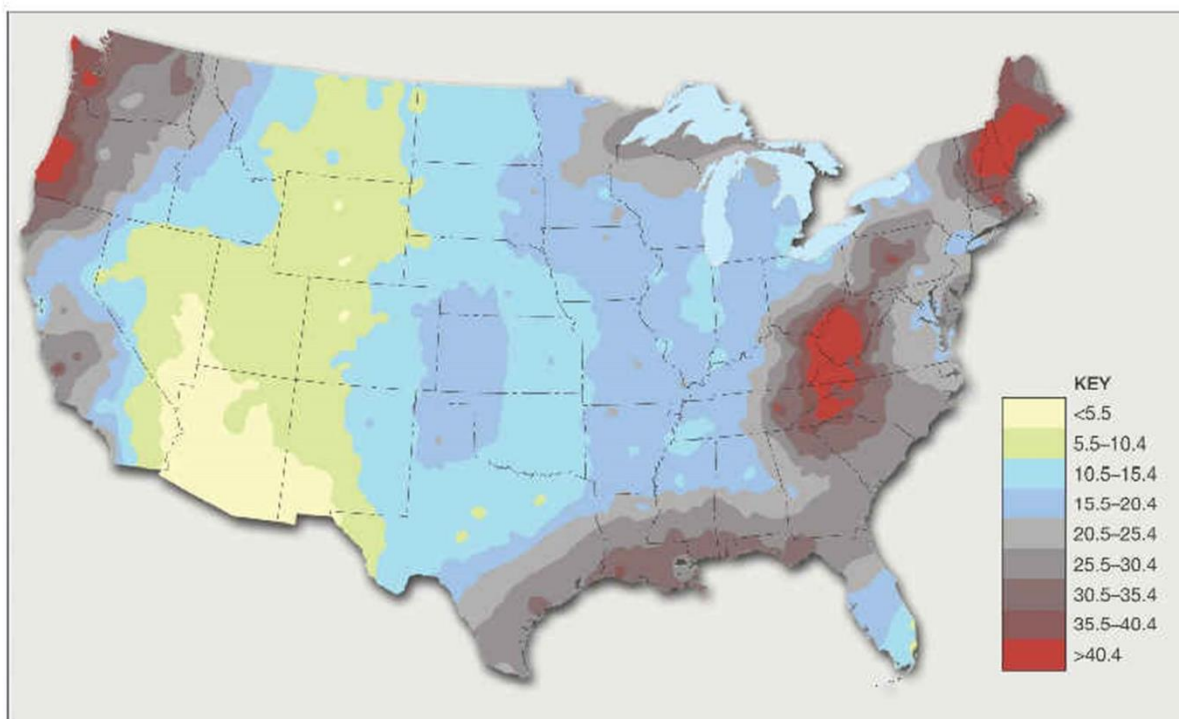
WGC Accenture Match Play	17.5
AT&T Pebble Beach Pro-Am	9.2
Phoenix Open	4.2

Percentage of Years in Which Measurable Snow Accumulated During the Month(s) of the Tournament

WGC Accenture Match Play	11.7
AT&T Pebble Beach Pro-Am	4.6
Phoenix Open	0.0

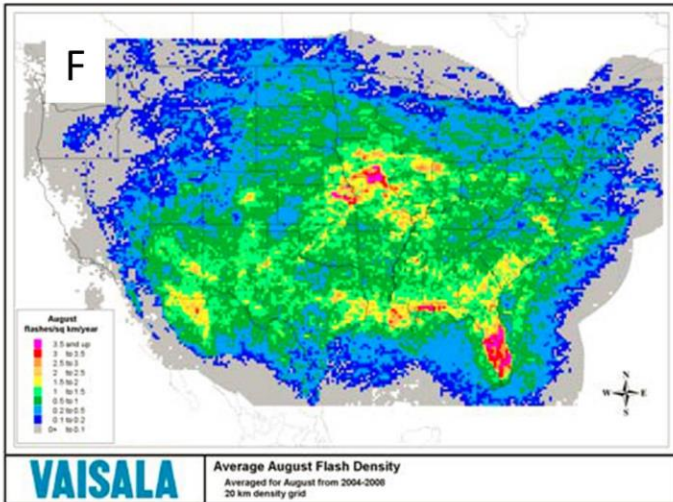
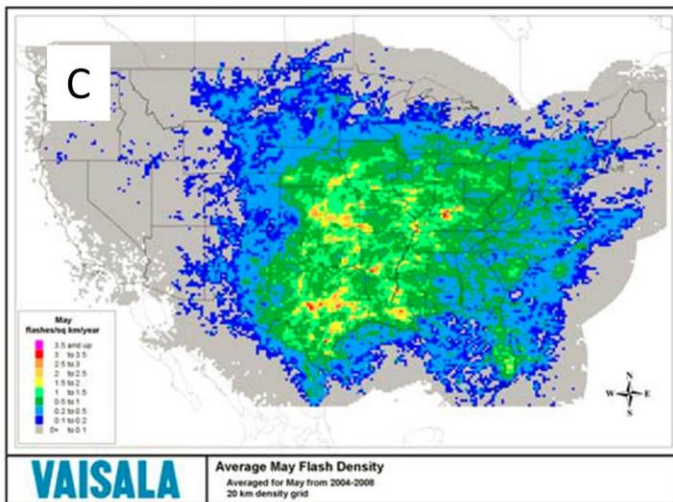
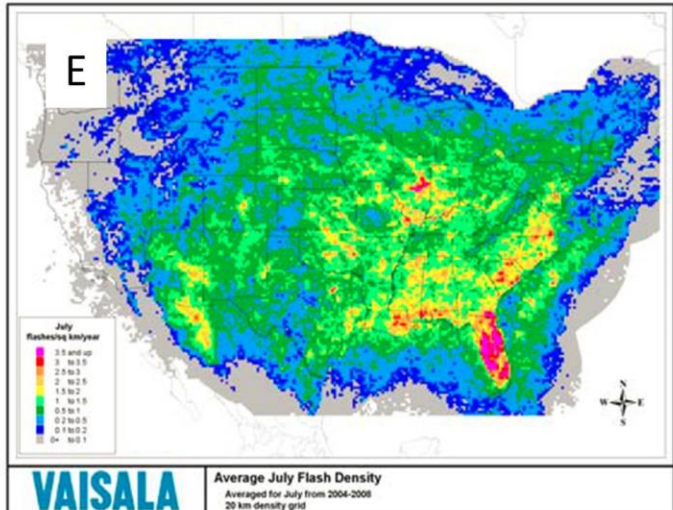
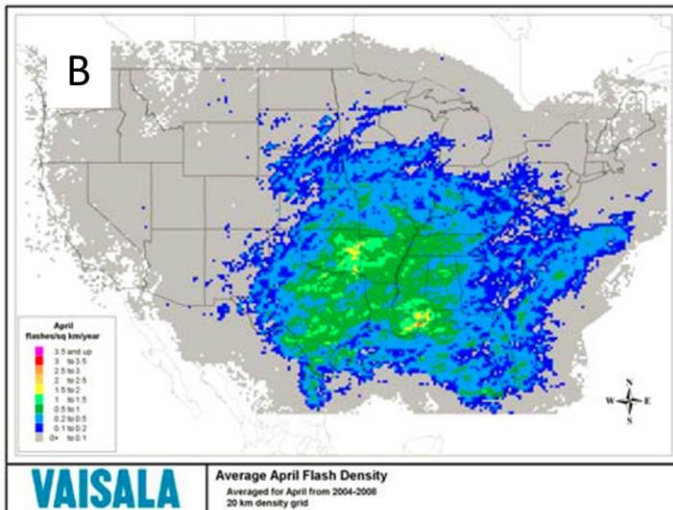
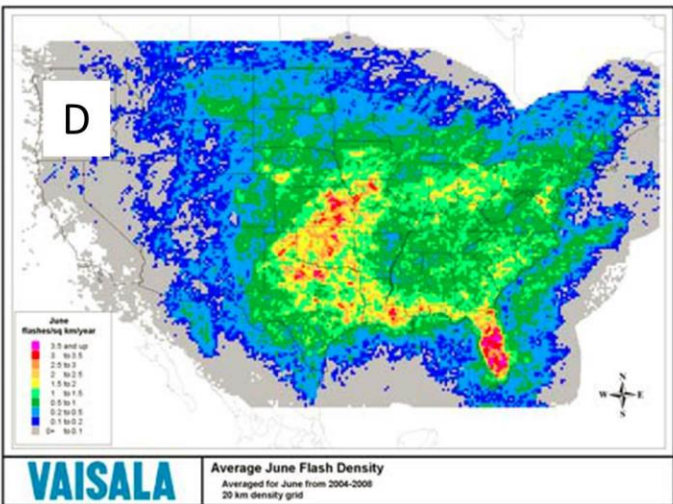
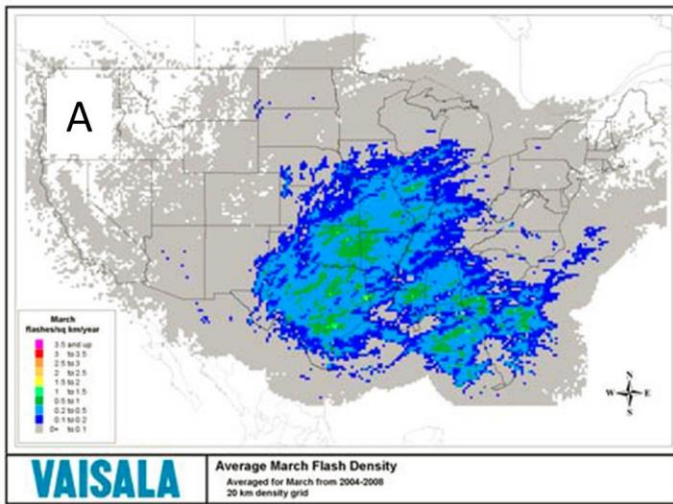
Foggiest Tournaments

The map below shows the average number of days per year with dense fog, defined as visibility of less than one-quarter mile ([Source](#)). Areas shaded in gray and red experience at least 20 days per year with dense fog, which results in a daily probability of about 5.5%. Based on hourly weather observations from the nearest airport station, the tournaments with the highest probability of experiencing dense fog are the **Wyndham Championship** (8.5%), the **Greenbrier Classic** (7.3%), the **Valero Texas Open** (7.0%), and the **Shell Houston Open** (5.9%). The probability of experiencing dense fog is slightly lower on the West Coast Swing (4.6% at the **Northern Trust Open** and 3.3% at the **Farmers Insurance Open**). Tournaments with the lowest probability of experiencing dense fog (less than 1%) are the **Phoenix Open**, the **Humana Challenge**, and the **BMW Championship**. The probability of dense fog drops to zero at the **WGC Accenture Match Play** and the **Shriners Hospital Open**.



Risk of Lightning

The maps below show the average number of cloud-to-ground lightning strikes across the continental U.S. by month (March-August) from 1997 to 2007 ([Source](#)). While Florida is typically seen as the state with the greatest risk of lightning strikes, this risk is not evenly distributed throughout the year. Fortunately, the events that make up the “Florida Swing” take place during the early spring when flash densities are relatively low across the Florida Peninsula (see map A below). The average strike density during the events that make up the “Southern Swing” is generally less than 1 strike per square kilometer, except around New Orleans (**Zurich Classic**) where the April strike density is greater than 2.5 strikes per square kilometer and around the Dallas-Fort Worth area (**Byron Nelson and Crowne Plaza Invitational**) where the May strike density is greater than 3 strikes per square kilometer. This represents the greatest climatological risk of lightning strikes among all PGA Tour events examined in this study. The events that make up the “Summer Swing”, except for the Reno-Tahoe Open, exhibit average monthly strike densities of at least 1 strike per square kilometer. The events with the highest strike densities (greater than 2 strikes per square kilometer) are the **AT&T National** and **John Deere Classic**.



Risk of Tropical Storms and Hurricanes

The maps below show the average number of tropical storms and hurricanes that occur in the Atlantic Basin from May through December (per 100 years) and the return period for a landfalling hurricane along the Gulf and Atlantic coasts ([Source](#)). The tournaments with the greatest probability of being affected by a tropical storm or hurricane are the **Wyndham Championship**, the **Barclays**, the **Deutsche Bank Championship**, and the **Tour Championship**, as these tournaments take place along the East Coast during the climatological peak of the Atlantic hurricane season (August-October). The risk of experiencing tropical storm or hurricane-force winds is greatest at the **Barclays** and **Deutsche Bank Championship** because of their proximity to the coastline. In addition, the **McGladrey Classic** takes place in early November along the southeast Georgia coast, near the end of the official Atlantic hurricane season.

