The CT CHIRPS China Xinjiang Precipitation Signal: China-Supply Moisture Overlay for Cotton

Why CHIRPS 30-day precipitation over Xinjiang (home to 80 percent of Chinese cotton production) delivers a 2.66 pp directional spread on Cotton forward 60-day returns across 36 years.

David Stendahl · Market Lab Analytics · November 6, 2026

The signal with the limits stated upfront

Three things the reader must know before the rest of this brief lands.

First, the full-distribution daily Spearman information coefficient against Cotton forward 60-day returns is plus 0.135 at p-value 1.8e-37 on a sample of 8,953 daily observations spanning 1990 through 2026. Strongly significant on the 36-year window and among the strongest signals in the Cotton library.

Second, Phase +1 (Precip Above Trend) delivers plus 1.19 percentage points above baseline across 4,772 trading days (53.3 percent of sample) and Phase –1 (Precip Deficit) delivers minus 1.47 percentage points below baseline across 2,517 days (28.1 percent). 2.66 pp directional spread between the extremes.

Third, the non-overlap independence test at 60-day sampling is sign-consistent and borderline significant. Across 150 independent samples the Spearman is plus 0.134 with p-value 0.10. Excess precipitation in arid Xinjiang can signal flood-disruption rather than pure yield support making Phase +1 interpretation two-channel.

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The thesis: Xinjiang moisture drives Chinese supply

China is the world largest cotton producer. Xinjiang province in northwestern China grows approximately 80 percent of Chinese cotton — a single-region concentration unparalleled in global cotton. Xinjiang production is arid-climate irrigation-dependent cotton; snowmelt from the Tianshan and Kunlun mountains feeds the irrigation infrastructure while additional growing-season precipitation supports yield and quality.

The CHIRPS satellite-rain-gauge blended precipitation product (Climate Hazards InfraRed Precipitation with Stations, UCSB Climate Hazards Center) provides daily 5-kilometer-resolution rainfall

estimates over Xinjiang with a multi-decade record. CHIRPS is the standard observational product for data-scarce regions and gives cleaner precipitation estimates than station-only networks over Xinjiang.

Moisture during the May through September Xinjiang cotton growing season directly determines yield and lint quality. The signal takes CHIRPS 30-day cumulative precipitation over the Xinjiang cotton-producing region, z-scores on a rolling window, and tanh-bounds. State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Cotton No. 2 first-nearby back-adjusted close.

Historical window: CHIRPS series from 1981; engine runs from 1990 onward with 504-bar warmup.

What the firings have actually done

Computed over 8,953 daily observations post-warmup from 1990 onward. The baseline Cotton forward 60-day return is mean plus 0.97 percent and median plus 0.15 percent across the live-window sample.

> **Baseline Cotton forward 60-day return:** mean plus 0.97 percent / median plus 0.15 percent across the live-window sample.
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> **Daily Spearman IC (fwd 60d):** plus 0.135, p-value 1.8e-37, N equals 8,953. Strongly significant.
>
> **Non-overlap IC (60-day step):** plus 0.134, p-value 0.10, N equals 150. Sign-consistent, borderline significant.
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> **Phase-conditional forward 60-day Cotton returns:** Phase +1 (Precip Above Trend, 4,772 days / 53.3 pct): plus 2.16 percent, edge plus 1.19 pp. Phase 0 (On Trend, 1,664 days / 18.6 pct): minus 0.24 percent, edge minus 1.21 pp. Phase −1 (Precip Deficit, 2,517 days / 28.1 pct): minus 0.50 percent, edge minus 1.47 pp.
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> 2.66 pp directional spread between Phase +1 and Phase −1.

Three findings. The daily IC is strongly significant on the 36-year window with sign-consistent borderline non-overlap test. Phase +1 (Precip Above Trend) is the majority bucket at 53.3 percent with plus 1.19 pp edge. Phase −1 (Precip Deficit) carries the sharper directional signal at minus 1.47 pp, but Phase 0 (On Trend) is almost indistinguishable from Phase −1 at minus 1.21 pp, suggesting the directional information concentrates in whether precipitation is above-trend rather than whether it is in deficit specifically.

Three cases that frame how to read the signal

The canonical anchors are the 2022 Xinjiang flooding period, the 2016 Xinjiang wet-season regime, and the 2017-2018 benign-deficit regime.

Case 1: The 2022 Xinjiang flooding period

Precip Above Trend firing anchored the mid-2022 period as Xinjiang experienced above-trend rainfall that disrupted cotton harvest logistics and raised supply concerns. Composite held in Phase +1 territory. Cotton rallied materially through 2022 consistent with the Phase +1 edge; the compound effect

of Texas megadrought on the US side plus Xinjiang disruption on the China side drove the broader cotton supply shock that took CT futures to multi-year highs.

Case 2: The 2016 Xinjiang wet-season regime

Precip Above Trend firing in mid-2016 as Xinjiang received well-above-trend growing-season precipitation. Composite held in Phase +1 territory through 2016 consistent with Cotton strength during the Indian-drought-plus-Chinese-disruption supply regime. This episode demonstrates the Phase +1 edge in a non-Texas-drought scenario.

Case 3: The 2017-2018 benign-deficit Xinjiang regime

Precip Deficit firing through 2017-2018 as Xinjiang precipitation ran below trend. Interestingly the yield impact was buffered by reliable snowmelt irrigation that stabilized production even as rainfall deficits persisted. Composite held in Phase −1 territory through the cycle-low Cotton pricing regime consistent with the Phase −1 edge; the benign-deficit setup matched broader bearish-supply conditions.

How to use this signal today

Composite is currently reading plus 0.756 in the Precip Above Trend band. The HEALTHY phase began September 2026, 40 trading days ago. CHIRPS 30-day precipitation over Xinjiang is running deeply above the rolling z-score mean through 2026 with raw z at plus 1.05.

Pair with the following for stacked conviction: US Cotton Belt DSCI (US supply via Z100008), India Vidarbha GRACE aquifer (India supply via Z32312), USDA WASDE stocks-to-use (systemic balance), CFTC positioning (speculator conviction via Z32350), and apparel-demand signals. This Xinjiang signal gives the Chinese supply-moisture lens; pair with US, India, and systemic signals for the full global supply read.

Reader rule: Precip Above Trend firings flag bullish setups (both supply-support and flood-disruption interpretations are consistent with the empirical). Precip Deficit firings flag bearish regimes where snowmelt irrigation buffers deficit precipitation.

Methodology

Data source: UCSB Climate Hazards Center CHIRPS daily precipitation at 5-kilometer resolution aggregated over the Xinjiang cotton-producing region bounding box. Computation: 30-day cumulative precipitation z-scored on a rolling window, tanh-bounded. State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Cotton No. 2 first-nearby back-adjusted close.

Historical window: CHIRPS daily precipitation series from 1981; engine runs from 1990 onward with a 504-bar warmup for the rolling z-score.

Validation computed on 8,953 post-warmup daily observations. Daily Spearman IC plus 0.135 at p-value 1.8e-37 across 8,953 observations, strongly significant on 36-year sample. Phase +1 per-day forward return plus 2.16 percent (plus 1.19 pp above plus 0.97 percent baseline). Phase −1 per-day forward return minus 0.50 percent (minus 1.47 pp below baseline). 2.66 pp directional spread. Non-overlap IC at 60-day sampling plus 0.134 at p-value 0.10 across 150 samples, sign-consistent and borderline significant.

What this signal does not cover

The signal does not cover non-Xinjiang Chinese cotton production (the remaining 20 percent from Hebei, Shandong, Hubei, Henan etc.). It does not capture snowmelt irrigation supply directly (see Tianshan snowpack signals). It does not capture Chinese cotton demand (domestic textile mill consumption). It does not cover realized production (USDA WASDE China cotton production). CHIRPS 30-day aggregation smooths short-horizon precipitation variability.

Disclaimer

This brief and the signal it describes are for informational purposes only and do not constitute investment, legal, tax, or trading advice. Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading. Also, since the trades have not been executed, the results may have under- or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. The phase-conditional forward-return stats reported above are a full-sample unconditional measurement. Readers should consult a licensed financial professional before taking any trading action.

References

UCSB Climate Hazards Center, Climate Hazards InfraRed Precipitation with Stations (CHIRPS) daily dataset, chc.ucsb.edu/data/chirps.

USDA Foreign Agricultural Service, Cotton: World Markets and Trade, fas.usda.gov.

ICE Futures US, Cotton No. 2 first-nearby back-adjusted continuous contract (ticker CT), end-of-day settlement.