nillion / nubila

Nubila: Enabling Decentralized Weather Intelligence

Introduction

Weather data shapes the way the world works.

It shapes everyday life from agriculture to energy and the systems that keep it all running depend on it.

When that data is inaccurate or incomplete, the impact is immediate. Food supply breaks down, power becomes unstable, travel is disrupted and the costs rise across entire economies.

The problem is that the **system delivering this information is limited.**

Forecasts usually come from satellites and a small number of centralized stations. They capture broad patterns but miss the local realities that drive disruption. Entire global regions have little to no coverage, and the places most exposed to climate volatility are often the ones with the least information.

As the climate grows more unpredictable, these gaps are no longer manageable.

Trillions are lost each year because decisions are made without reliable data.

This is the gap Nubila was created to close.

They are building a decentralized weather network where communities can host devices, share local data and benefit from it. That data becomes intelligence that strengthens the systems we rely on.

But to see why Nubila matters, first we have to understand the consequences of today's failing system.

PART 1:

The Blind Spots of Today's Weather Systems

When today's weather systems fall short, the cost shows up in billions lost and lives turned overnight.

In 2025:

$160 billion

Natural disasters caused more than **$160 billion** in global economic losses

$40 billion

The **Palisades Fire in California** is expected to leave behind **$40 billion** in damages on its own.

$100 billion

Insured losses reached over **$100 billion**, putting this year on track to be one of the costliest in history.

Each number is a story of disruption on the ground.

In Europe, an unexpected blackout left millions without power, shutting down services for hours.

In Texas, flash floods rose faster than forecasts could warn, submerging towns and forcing thousands from their homes.

In India, heavy monsoon rains wiped out millions of acres of crops, leaving farmers with nothing to harvest.

Different region, different disaster.

Until these blind spots are closed, the losses in lives and in livelihoods will only grow.

PART 2:

Nubila: Breaking the Weather Monopoly

Nubila is building the world's most granular environmental data network.

At its core is a DePIN model where the communities host weather stations, contribute local data and earn from it. That data becomes climate intelligence that strengthens the systems.

But until now, this kind of intelligence has been out of reach.

Weather hardware is expensive, meaning dense coverage exists only in high-income regions.

Even in the U.S. National Weather Service runs **fewer than 13,000 stations across the entire country.** In Africa, India, and much of Latin America, the coverage is close to non-existent. Without those stations, entire regions are left blind to the very signals that could protect lives and economies.

Most forecasts today are AI-driven, from global-scale models built by Google and NVIDIA to sector-specific systems in energy and insurance.

But no matter how advanced the algorithm, the output is only as good as the data underneath it.

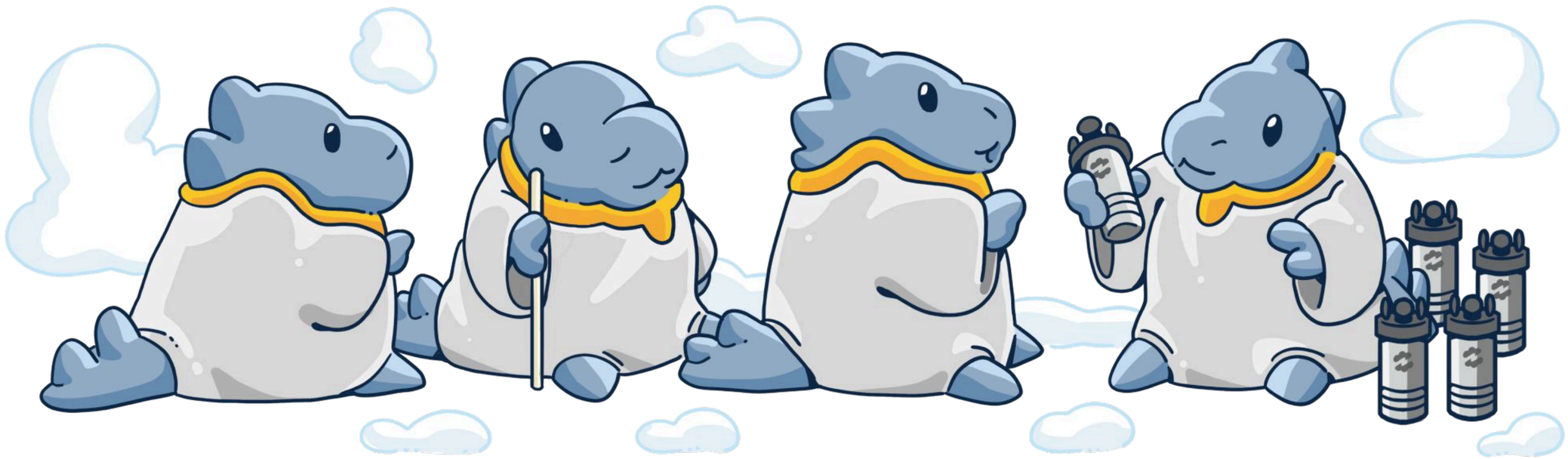
Without verifiable ground truth, predictions break down. Nubila turns local signals into the input that modern AI needs to stay accurate.

More than **21,000** stations are already deployed worldwide, **supported by 16,000 validator nodes** and over **110 terabytes of data**. It is the most active, distributed weather mesh ever assembled.

And the intelligence it generates is protected by Nillion.

All the data flows into **nilDB**, where it can be stored, processed and shared without ever exposing the raw inputs. Institutions can access precisely the insights they need without compromising the privacy or integrity of the underlying data.

Moving on, let's understand the architecture that makes it work.



PART 3:

Under the Hood of Nubila.

How Weather Becomes Intelligence.

While most weather systems ask you to trust their output, Nubila shows you the path from raw signal to decision-ready intelligence.

Its architecture is built in four layers:

1. DePIN Layer - Marco devices capture hyper-local signals like rainfall, wind speed, solar radiation, and air quality, hosted by communities and industries.

2. Validation and Consensus Layer - Validator nodes check each reading against nearby devices and external datasets. Bad data gets filtered out, and a cryptographic consensus locks in what can be trusted.

3. Oracle Layer - Once validated, Nubila doesn't put the full dataset onchain. Instead, the network records a reference on Monad, proving the data exists and can be trusted. The complete dataset stays in nilDB, stored privately and ready to be accessed when needed.

4. Application Layer - Enterprises and AI models consume Nubila's intelligence for agriculture, energy, logistics, or finance. Developers can access it through APIs and SDKs.

TRUST IS BUILT INTO THE NETWORK

For weather intelligence to matter, it has to be trusted and **Nubila makes that trust verifiable**.

Every reading from a Marco device is signed cryptographically, making it impossible to alter in transit.

Validator nodes then cross-check submissions against neighboring sensors and external datasets, flagging anything that doesn't align.

The system aligns incentives around accuracy.

Device operators earn for providing reliable data, while validators back their role with staked tokens and face penalties if they fail checks. Over time, reputation scores give greater weight to the most consistent contributors, securing trust across the network.

And because every transformation and validation proof is recorded onchain, the process is fully transparent. Anyone can trace the path from raw signal to verified intelligence.

PART 4:

The Nubila Expansion.

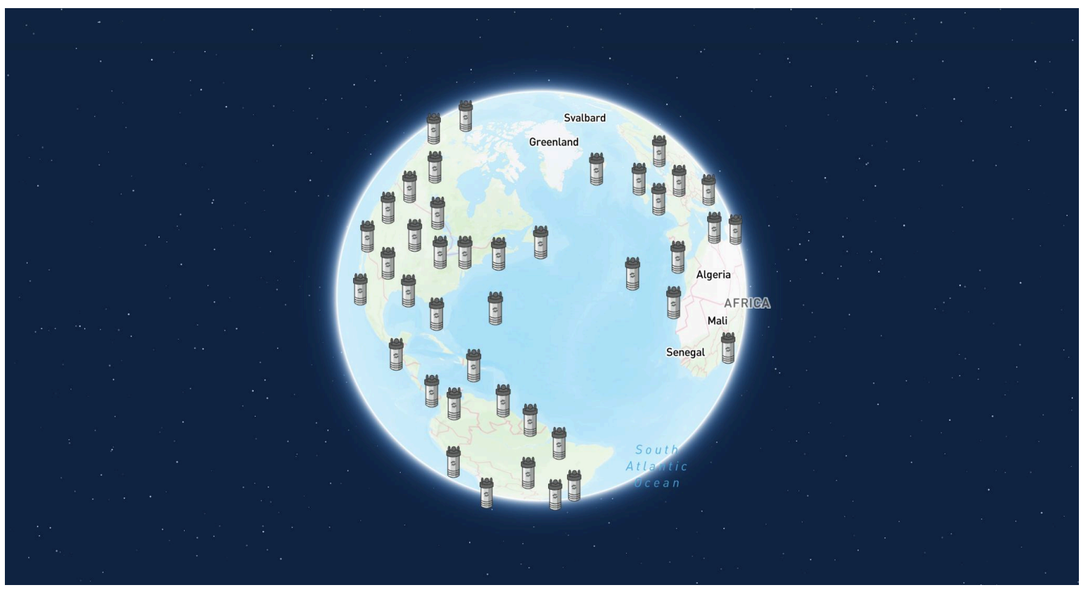
What began as a concept is now a global network, expanding across new regions.

In the past year, **Nubila acquired BloomSky** to secure hardware manufacturing and supply chain strength, launched the first Marco station, and scaled to more than **21,000 devices deployed in more than 120 countries**.

Additionally, they have deployed **30+ stations in Dallas** to supply hyper-local wind data for a drone-delivery pilot around Walmart locations, planning safe routes at neighborhood scale.

Similar micro-networks are being replicated across the U.S. to fill coverage black spots, while in **India and Africa**, Nubila is exploring to build entirely new grids of ground truth where little or no public weather service exists, including pilots with farmers and conversations with reinsurers like **Swiss Re**.

Real-world energy use cases are underway. With the Global Solar Council, Nubila is refining solar-output forecasting supported by irradiance sensors; in parallel, a Microgrid & Battery Optimization Agent helps utilities balance distributed energy sources in real time.



The strength of the network is amplified by its strong partnerships.

IoTeX

IoTeX gives every Nubila device a verifiable onchain identity, ensuring each data point can be trusted at its source.

MONAD

Monad provides the high-throughput infrastructure needed to push thousands of sensor readings on-chain with sub-second finality, keeping oracle data fast and affordable.

ELIZAOS

ElizaOS integrates Nubila into autonomous agents, turning real-world sensors into the “eyes on the ground” for AI systems.

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And at the foundation, **Nillion** secures Nubila’s intelligence in **nilDB**, ensuring sensitive environmental data can be used without ever exposing the raw signals.

Nubila's next chapter is about scale, expanding from weather into the wider area of environmental intelligence.

PART 5:

The Road Ahead

From thousands of devices today to entire industries tomorrow, Nubila's path forward is already in motion.

Here's what's coming next:

Q4 2025

PROVING THE MODEL

Their focus for the rest of 2025 is execution in the real world.

Nubila is being integrated into onchain weather betting markets, launching its first oracle on a high-performance chain, and bringing on enterprise clients across different industries.

2026

EXPANDING THE DATA LAYER

Weather is the entry point, but the scope is much broader.

The next phase includes capturing air quality, soil health and water levels to provide a full picture of environmental conditions.

With every new data stream, Nubila grows from a weather network into the foundation of global environmental intelligence.

2027

FINANCIAL INFRASTRUCTURE

On the financial side, Nubila is developing climate-linked derivatives, parametric insurance, and ESG products that rely on its data as the source of truth.

Contributors will also gain new ways to participate through data staking and liquidity pools, turning environmental signals into programmable financial assets.

Final destination

A GLOBAL BASE LAYER

Nubila's long-term vision is building the trusted backbone for environmental intelligence. Thousands of new sensing nodes will be deployed, with a focus on regions that have historically lacked coverage.

Oracles will expand beyond DeFi into AI, renewable energy, and institutional climate finance, carrying real-world environmental data directly into the systems that need it most.

It won't happen overnight. But Nubila has already taken charge of the path forward, laying the groundwork for a network that will anchor industries for decades to come.

PART 6:

Building Nubila Together

The future of weather intelligence won't come from a single source, it will be built collectively, by those who choose to take part.

Here's how you can join the network today:

HOST A STATION

Nubila's Marco devices are the backbone of the network.

By hosting a device, you capture hyper-local signals such as rainfall, wind speed, solar radiation, air quality, that no satellite or central station can see.

Each reading strengthens the global mesh while earning rewards for the data you provide.

RUN A VALIDATOR NODE

Validator nodes are what keep Nubila honest. They cross-check sensor readings, filter out errors, and reach cryptographic consensus.

Whether you run a lightweight Cloud node, a mid-tier Rainy node, or a heavyweight Sunny node, you help ensure the data that powers daily life stays accurate and reliable.

JOIN THE COMMUNITY

Not everyone has to host a station or run a validator node, but anyone can still take part.

Nubila runs campaigns and experiments where the community can contribute to building better weather intelligence.

From sharing local observations to joining interactive challenges, there are always ways to participate, strengthen the network, and be rewarded for it.

THE NEXT FOUNDATION

For decades, weather enthusiasts and hobbyists have been sharing local readings for free. The data flowed upward, but the value never came back down.

With Nubila, every contribution earns its rewards. What was once a one-sided system has now become a common ground for climate intelligence.

The foundation is laid, and the time to build it is now.