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Weather Without Climate: Analyzing the Scientific Flaws in the NCAR Rescoping Plan

Climate Change * Computing * Physics

Introduction: The NSF 26-203 Directive and NCAR's Legacy

Since its founding in 1960 under the University Corporation for Atmospheric Research (UCAR) and founding director Walter Orr Roberts -- building on the 1940 Climax coronagraph observatory and the 1967 dedication of I.M. Pei's iconic Mesa Laboratory in Boulder, Colorado -- the National Center for Atmospheric Research (NCAR) has served[13] as the intellectual nucleus of American and global atmospheric science.[1][2] For over six decades, NCAR unified solar physics, meteorology, and coupled Earth-system modeling, sharing the 2007 Nobel Peace Prize for its foundational contributions to climate science.[2]

Following a December 2025 White House Office of Management and Budget directive characterizing the center as a source of "climate alarmism," the National Science Foundation issued Dear Colleague Letter NSF 26-203 ("NSF Intent to Restructure Critical Weather Infrastructure") on January 23, 2026, with a March 13, 2026 response deadline.[1][3] The directive proposes transferring the NCAR-Wyoming Supercomputing Center (NWSC) to a third-party operator, divesting the Gulfstream V and EC-130 research aircraft, exploring privatization or alternative ownership for the Mesa Laboratory, and restricting research narrowly to seasonal weather prediction, severe local storms, and space weather -- eliminating climate science and atmospheric chemistry.[2][3][5] Leading atmospheric physicists, including Dr. Daniel L. Swain of the University of California and former NCAR directors, have demonstrated that partitioning short-term weather from long-term Earth system thermodynamics violates fundamental atmospheric physics and jeopardizes national security and economic resilience.[6][8]

Deconstructing the Rescoping Plan and the Redundancy Fallacy

A core premise of NSF 26-203 is that NCAR's modeling and observational functions duplicate capabilities held by private forecasting firms or federal agencies such as the National Oceanic and Atmospheric Administration (NOAA).[1][3] In reality, NCAR functions as the "global mothership" of the Earth system science pipeline.[4] Commercial weather vendors, insurance underwriters, agricultural conglomerates, and grid operators do not maintain independent planetary general circulation codebases; they build their proprietary risk products directly atop NCAR's open-source dynamical cores, physical parameterizations, and continuous reanalysis datasets.[2][9] Severing this foundational research layer from downstream operational forecasting threatens the entire predictive ecosystem.

| Infrastructure Pillar | | Current Integrated NCAR Function | | Proposed Action (NSF 26-203) | | Primary Scientific & Operational Vulnerability |

| Wyoming Supercomputing Center (Derecho) | | Executes coupled Earth system and

mesoscale models for 1,500+ scientists across 500 universities. | | Transfer operations to a third-party operator (e.g., University of Wyoming solicitation). | | Decouples numerical software engineering from hardware optimization; risks access paywalls.[1][10] |

| Airborne Observational Fleet | | In-situ sampling of cloud microphysics, aerosols, and storm kinematics. | | Accelerated divestment or transfer of NSF/NCAR GV and EC-130 aircraft. | | Eliminates empirical boundary-layer and plume data required to calibrate numerical models.[3][5] |

| Mesa Laboratory Facility | | Centralized interdisciplinary hub housing instrumentation and 830 specialized staff. | | Solicit alternative ownership or private real-estate disposition. | | Fragments human capital ("lost generation") and breaks multi-decade instrumental climate records.[1][2] |

| Scientific Scope | | Unified fluid dynamics, atmospheric chemistry, and coupled climate-weather modeling. | | Restrict narrowly to seasonal forecasting, severe storms, and space weather. | | Blinds forecasters to non-stationary thermodynamic boundary conditions driving compound extremes.[3][20] |

Computational Foundations: CESM, WRF, and Supercomputing Integration

The scientific flaw in separating weather from climate is embedded in the mathematical architecture of NCAR's two flagship community models: the Community Earth System Model (CESM) and the Weather Research and Forecasting (WRF) model.[9][15] Both solve the same primitive Navier-Stokes fluid dynamics equations, thermodynamic energy conservation laws, and radiative transfer equations on a rotating sphere, governed by principles of climate modeling.[15]

CESM couples atmosphere, ocean, land-surface, and sea ice working groups to simulate multi-decadal response to greenhouse gas and volcanic aerosol radiative forcing.[15][16] Because internal chaotic variability obscures forced thermodynamic signals, NCAR pioneered the CESM Large Ensemble (CESM-LE) -- running 30+ parallel trajectories from 1920 to 2100 with microscopic (10-14 K) initial temperature perturbations to quantify the probability distribution of high-impact weather events.[14] Meanwhile, WRF -- co-developed with NOAA, the U.S. Air Force, the Navy, and the FAA and used in over 150 countries -- downscales global boundary conditions to resolve mesoscale convective systems, downslope windstorms, and wildfire smoke dispersion.[9][12] Decoupling the NWSC Derecho supercomputer from the NCAR software scientists who iteratively tune sub-grid parameterizations and nudging timescales threatens to freeze the evolution of both models.[1][18][19]

Thermodynamic Reality: Hydroclimate Whiplash and Atmospheric Rivers

The physical impossibility of forecasting "weather without climate" is starkly illustrated by Dr. Daniel Swain's 2025 research on hydroclimate whiplash -- rapid, large-amplitude swings between intense pluvial deluge and flash drought.[20] Governed by the Clausius-Clapeyron relation, saturation water vapor pressure (es) increases exponentially with absolute temperature (T) at roughly 7% per degree Celsius of warming:[20]

(des/es) = (Lv/Rv T2) dT ~ 0.07 K-1

This expansion of the "atmospheric sponge" accelerates the hydrological cycle in both directions: during dry regimes, higher vapor pressure deficit (potential evaporative demand) desiccates soils and vegetation into flammable tinder; during wet regimes, converged moisture releases vastly heavier precipitation.[20] Using the Standardized Precipitation Evapotranspiration Index (SPEI) across CESM large ensembles, Swain et al. documented substantial historical and projected surges in volatility.[20]

| Hydroclimate Volatility Metric | | Temporal Window | | Observed Increase (Mid-20th Century to Present) | | Projected Increase (at +3 deg C Global Warming) |

| Subseasonal Whiplash | | 3-Month SPEI Transitions | | +31% to +66% | | +113% |

| Interannual Whiplash | | 12-Month SPEI Transitions | | +8% to +31% | | +52% |

| Thermodynamic Mechanism | | Clausius-Clapeyron Scaling | | Exponential vapor capacity (+7%/ deg C) | | Amplified vapor pressure deficit & rain rates |

Similarly, predicting compound hazards from atmospheric river families -- clustered corridors of intense meridional water vapor transport driven by shifting teleconnections and blocking ridges -- requires coupling global sea-surface temperature and Arctic sea-ice boundary conditions (CESM) with storm-resolving terrain and post-fire debris-flow models (WRF).[17][20][21][22] Short-range weather models stripped of coupled climate baselines cannot capture these non-stationary precursors.[3][20]

Empirical Aircraft Validation, Infrastructure Resilience, and National Security

Numerical models require continuous empirical calibration from airborne platforms. During the 2018 WE-CAN field campaign, the NSF/NCAR C-130 aircraft penetrated western wildfire plumes with proton-transfer-reaction time-of-flight mass spectrometers to quantify volatile organic compound oxidation and aerosol absorption -- measurements directly ingested into WRF-Chem to guide municipal air-quality warnings and utility preemptive power shutoffs.[9][11] Likewise, multi-decade anemometer continuity at the Mesa Laboratory enabled forensic attribution of Boulder downslope windstorm trends.[23]

Beyond basic science, NCAR's discovery of convective microbursts underpins wind-shear warning systems at over 100 U.S. airports, while civil engineers and defense planners rely on CESM projections for dam safety, grid resilience, and military range operations.[9][12] Paradoxically, while NSF Important Notice No. 149 (July 2025) tightened research security under the CHIPS and Science Act and NSPM-33 to protect American intellectual property,[3] dismantling NCAR would cede global leadership in Earth system modeling to European and Asian state-sponsored centers.[1][7]

| NSF Important Notice No. 149 Mandate | | Effective Date | | Core Compliance Requirement | | Strategic Paradox vs. NSF 26-203 |

| Research Security Training | | Dec 2, 2025 | | Mandatory cybersecurity & conflict training for key personnel. | | Protects IP while NSF 26-203 disperses 830 core NCAR staff.[2][3] |

| Foreign Talent & Gift Disclosures | | In Effect / Dec 2025 | | Bans malign talent programs; tracks foreign support >$50,000. | | Cedes open-source Earth modeling leadership to foreign competitors.[1][3] |

Conclusion: The Scientific Fallacy of Separating Weather from Climate

The scientific community's March 2026 response to NSF 26-203 demonstrates that the bureaucratic boundary between "weather" and "climate" does not exist in physical reality.[6][8] Short-term convective storms, atmospheric river families, and wildfire plumes evolve within a non-stationary background state governed by Clausius-Clapeyron thermodynamics and global radiative forcing.[20][21] Dismantling NCAR's Mesa Laboratory, divesting its research aircraft, and decoupling its supercomputing center would sever the iterative feedback loop between physical observation, fundamental fluid-dynamical theory, and high-resolution numerical simulation -- systematically degrading American disaster preparedness, critical infrastructure resilience, and long-term scientific sovereignty in an era of accelerating hydroclimate volatility.[1][2][7]

Litigation and Institutional Status (March-November 2026): Following the March 13, 2026 comment period, UCAR filed suit in U.S. District Court in Colorado on March 16, 2026 challenging the restructuring directive under the Administrative Procedure Act, securing a June 1, 2026 preliminary injunction blocking transfer of the NCAR-Wyoming Supercomputing Center away from UCAR.[6] The Environmental Defense Fund (EDF) filed a parallel August 2026 suit citing National Historic Preservation Act protections for the Mesa Laboratory, and on September 10, 2026, EDF and the Union of Concerned Scientists filed a Freedom of Information Act lawsuit against NSF and the White House Office of Management and Budget over withheld restructuring records.[6][24]

Updates... (Nov 23, 2026): Consolidated prior Nov 20, 2026 updates; corrected Reference #12 (Data Foundation statement) publication date from 2026 to Dec 22, 2025 per source metadata and standardized Clausius-Clapeyron equation spacing.

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