

119TH CONGRESS  
1ST SESSION

# S. 1484

To improve weather research and forecasting by the National Oceanic and Atmospheric Administration, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

APRIL 10, 2025

Mr. MARKEY (for himself, Mr. WICKER, Mr. PADILLA, and Ms. ROSEN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

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## A BILL

To improve weather research and forecasting by the National Oceanic and Atmospheric Administration, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*  
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Forecasting Optimiza-  
5 tion for Robust Earth Climate Analysis and S2S Tracking  
6 Act of 2025” or the “FORECAST Act of 2025”.

1 **SEC. 2. IMPROVEMENTS TO WEATHER RESEARCH AND**  
2 **FORECASTING.**

3 (a) IMPROVEMENTS TO SUBSEASONAL-TO-SEASONAL  
4 FORECASTING.—Section 1762 of the Food Security Act  
5 of 1985 (15 U.S.C. 8521) is amended—

6 (1) by amending subsection (c) to read as fol-  
7 lows:

8 “(c) FUNCTIONS.—

9 “(1) IN GENERAL.—The Under Secretary and  
10 the heads of such other programs of the National  
11 Oceanic and Atmospheric Administration as the  
12 Under Secretary considers appropriate, shall—

13 “(A) conduct and support fundamental re-  
14 search to improve understanding of the sources  
15 and limitations of season-to-season predict-  
16 ability for temperature, precipitation, and other  
17 Earth system variables and applications;

18 “(B) collect and utilize observational data  
19 across the Earth system and other information  
20 in order to make usable, reliable, and timely  
21 foundational forecasts of subseasonal-to-sea-  
22 sonal temperature and precipitation;

23 “(C) prioritize the advancement of multi-  
24 model ensemble forecast systems and forecast  
25 verification and evaluation capacity, including—

1           “(i) the development of advanced cou-  
2           pled data assimilation methods using ro-  
3           bust Earth system observational data;

4           “(ii) the development of improved cou-  
5           pled subseasonal-to-seasonal ensemble pre-  
6           diction systems;

7           “(iii) the improvement of exchanges  
8           and interactions between datasets across  
9           different models and Earth system obser-  
10          vations to better understand local relation-  
11          ships between and drivers of ocean, land,  
12          snow, and ice observations;

13          “(iv) the provision of additional re-  
14          sources for the research and development  
15          of multi-model ensemble forecasts for pur-  
16          poses of advanced forecast modeling; and

17          “(v) the development of data manage-  
18          ment strategies to support operations and  
19          research activities;

20          “(D) leverage existing research and models  
21          from the weather and Earth system enterprises  
22          to improve the forecasts under subparagraph  
23          (B);

24          “(E) accelerate the operationalization of  
25          emerging modeling technologies developed with-

1 in the research community, including pursuant  
2 to collaborations with other agencies and enti-  
3 ties, as determined appropriate through in-  
4 creased funding for activities under section  
5 102(b)(5) of the Weather Research and Fore-  
6 casting Innovation Act of 2017 (15 U.S.C.  
7 8512(b)(5)), to support and assist the cross de-  
8 velopment of fully coupled subseasonal-to-sea-  
9 sonal forecast systems;

10 “(F) determine and provide information on  
11 how the subseasonal-to-seasonal temperature  
12 and precipitation, as forecasted under subpara-  
13 graph (B) may relate to—

14 “(i) the number and severity of torna-  
15 does, droughts, hurricanes, fires, floods,  
16 heat waves, marine heat waves, coastal in-  
17 undation, winter storms, high-impact  
18 weather, or other relevant natural disas-  
19 ters;

20 “(ii) snowpack;

21 “(iii) sea ice conditions; and

22 “(iv) permafrost thaw and increased  
23 microbial decomposition;

24 “(G) develop an Internet clearinghouse to  
25 provide the forecasts under subparagraph (B)

1 and the information under subparagraphs (B)  
2 and (F) on both national and regional levels;  
3 and

4 “(H) leverage emerging technologies, such  
5 as artificial intelligence, machine learning, and  
6 use of unmanned systems.

7 “(2) ALIGNMENT WITH REPORT.—The Under  
8 Secretary and the heads of such other programs of  
9 the National Oceanic and Atmospheric Administra-  
10 tion as the Under Secretary considers appropriate  
11 shall carry out the requirements under paragraph  
12 (1) in alignment with the findings of the report sub-  
13 mitted to Congress by the Under Secretary pursuant  
14 to subsection (h) on July 12, 2018, entitled, ‘Sub-  
15 seasonal and Seasonal Forecasting Innovation: Plans  
16 for the Twenty-First Century’.

17 “(3) EARTH SYSTEM DEFINED.—In this sub-  
18 section, the term ‘Earth system’ includes atmos-  
19 phere, ocean, terrestrial, ice, and related processes,  
20 and data that influence or drive subseasonal-to-sea-  
21 sonal weather and climate.”; and

22 (2) by amending subsection (j) to read as fol-  
23 lows:

24 “(j) AUTHORIZATION OF APPROPRIATIONS.—

1           “(1) IN GENERAL.—There are authorized to be  
2 appropriated to the Under Secretary, for each of fis-  
3 cal years 2026 and 2027—

4           “(A) \$28,500,000 to carry out this section;

5           and

6           “(B) for activities under section 102(b)(5)  
7 of the Weather Research and Forecasting Inno-  
8 vation Act of 2017 (15 U.S.C. 8512(b)(5)) pur-  
9 suant to subsection (c)(1)(E), such sums as  
10 may be necessary to carry out such subsection.

11          “(2) USE OF FUNDS.—Amounts appropriated  
12 pursuant to an authorization under paragraph  
13 (1)(B) shall be used for the designated responsibil-  
14 ities of the modeling team of the National Oceanic  
15 and Atmospheric Administration within the Earth  
16 Prediction Innovation Center or an institution of  
17 higher education (as defined in section 101(a) of the  
18 Higher Education Act of 1965 (20 U.S.C.  
19 1001(a))), including activities that fall under the fol-  
20 lowing focus areas:

21           “(A) High-performance computing.

22           “(B) Scientific innovation.

23           “(C) Management and planning.

24           “(D) External engagement and commu-  
25 nity.”.

1 (b) WEATHER AND EARTH SYSTEM MODELING AND  
2 DATA ASSIMILATION WORKFORCE INNOVATION PRO-  
3 GRAM.—

4 (1) IN GENERAL.—Title IV of the Weather Re-  
5 search and Forecasting Innovation Act of 2017 (15  
6 U.S.C. 8541 et seq.) is amended by adding at the  
7 end the following:

8 **“SEC. 415. WEATHER AND EARTH SYSTEM MODELING AND**  
9 **DATA ASSIMILATION WORKFORCE INNOVA-**  
10 **TION PROGRAM.**

11 “(a) IN GENERAL.—The Under Secretary shall es-  
12 tablish a program, to be known as the ‘Weather and Earth  
13 System Modeling and Data Assimilation Workforce Inno-  
14 vation Program’ (in this section referred to as the ‘pro-  
15 gram’).

16 “(b) EDUCATION AND RECRUITMENT.—In carrying  
17 out the program, the Under Secretary shall support the  
18 education and recruitment of personnel and establish a set  
19 of new workforce development programs to develop path-  
20 ways for next-generation researchers, engineers, and prac-  
21 titioners who are skilled in and can operate or develop  
22 weather and Earth system technologies that exploit and  
23 advance emerging computing architectures, artificial intel-  
24 ligence and machine learning, unmanned systems, and  
25 next-generation data assimilation and observing systems,

1 including through financial assistance for scholarships, fel-  
2 lowships, and research at institutions of higher education  
3 in areas relevant to improvement of data assimilation sys-  
4 tems and weather and Earth system data modeling capa-  
5 bilities.

6 “(c) HUMAN CAPITAL PLANNING.—

7 “(1) IN GENERAL.—In carrying out the pro-  
8 gram, the Under Secretary shall develop and, on an  
9 annual basis, revise a data assimilation and weather  
10 and Earth system modeling workforce human capital  
11 plan that identifies workforce needs to facilitate in-  
12 novation in emerging weather technologies and data  
13 assimilation systems, including by identifying gaps  
14 in funding and expertise, hiring challenges, and poli-  
15 cies to mitigate turnover that will help avoid mid-  
16 project staffing changes.

17 “(2) SUBMISSION OF PLAN.—The Under Sec-  
18 retary shall submit the data assimilation and weath-  
19 er and Earth system modeling workforce human  
20 capital plan required under paragraph (1), and any  
21 revision to that plan, to the Secretary of Commerce  
22 and the Director of the Office of Management and  
23 Budget.

24 “(3) USE OF PLANS.—

1           “(A) IN GENERAL.—The Under Secretary  
2           shall use the data assimilation and weather and  
3           Earth system modeling workforce human capital  
4           plans required under paragraph (1) to carry  
5           out the education and recruitment required  
6           under subsection (b).

7           “(B) PATHWAYS TO HIRING.—In carrying  
8           out the data assimilation and weather and  
9           Earth system modeling workforce human capital  
10          plan required under paragraph (1), the  
11          Under Secretary may use the pathways pro-  
12          grams established under part 362 of title 5,  
13          Code of Federal Regulations (or a successor  
14          program), to facilitate the recruitment and hir-  
15          ing of personnel for data assimilation and  
16          weather and Earth system modeling activities.

17          “(4) AUTHORITY TO PROVIDE FUNDS.—If the  
18          Under Secretary, in preparing the data assimilation  
19          and weather and Earth system modeling workforce  
20          human capital plan pursuant to paragraph (1), iden-  
21          tifies workforce gaps for the data assimilation and  
22          weather and Earth system modeling processes of the  
23          National Oceanic and Atmospheric Administration,  
24          the Under Secretary may—

1           “(A) use funds made available to the Ad-  
2           ministration to carry out such plan; and

3           “(B) establish agreements and awards with  
4           institutions of higher education or nonprofit en-  
5           tities to facilitate the integration of innovative  
6           data assimilation and weather and Earth sys-  
7           tem modeling technologies and systems into the  
8           larger weather enterprise.

9           “(d) UPDATES TO DIRECT HIRING AUTHORITY.—  
10          The Under Secretary, acting through the Director of the  
11          Office of Human Capital Services, shall make necessary  
12          updates to the eligibility requirements for the direct hiring  
13          authority program of the National Oceanic and Atmos-  
14          pheric Administration to include the program, the Weath-  
15          er Program Office Innovation for Next Generation Sci-  
16          entists Dissertation Fellowship, the Consortium for Ad-  
17          vanced Data Assimilation Research and Education, and  
18          any other fellowship or internship programs determined  
19          by the Under Secretary to be relevant to the weather en-  
20          terprise.

21          “(e) REPORT.—Not later than 2 years after the ini-  
22          tial date on which the Under Secretary provides funds  
23          under subsection (c)(4) to an institution of higher edu-  
24          cation or a nonprofit entity, the Under Secretary shall,  
25          using information about the program collected from any

1 such institution or entity in receipt of those funds, submit  
2 to the Committee on Commerce, Science, and Transpor-  
3 tation of the Senate and the Committee on Science, Space,  
4 and Technology of the House of Representatives a report  
5 on the effectiveness and impact of those funds in improv-  
6 ing the quality and preparedness of the weather and Earth  
7 system modeling and data assimilation workforce.

8 “(f) DEFINITIONS.—In this section:

9 “(1) EARTH SYSTEM.—The term ‘Earth sys-  
10 tem’ includes atmosphere, ocean, terrestrial, ice, and  
11 related processes, and data that influence or drive  
12 subseasonal-to-seasonal weather and climate.

13 “(2) INSTITUTION OF HIGHER EDUCATION.—  
14 The term ‘institution of higher education’ has the  
15 meaning given that term in section 101 of the High-  
16 er Education Act of 1965 (20 U.S.C. 1001).

17 “(3) NONPROFIT ENTITY.—The term ‘nonprofit  
18 entity’ has the meaning given that term in section  
19 9901 of the William M. (Mac) Thornberry National  
20 Defense Authorization Act for Fiscal Year 2021 (15  
21 U.S.C. 4651).

22 “(g) AUTHORIZATION OF APPROPRIATIONS.—There  
23 are authorized to be appropriated to the Under Secretary  
24 such sums as may be necessary to carry out the functions  
25 of the program, as determined by the Under Secretary.”.

1           (2) CLERICAL AMENDMENT.—The table of con-  
2           tents in section 1(b) of the Weather Research and  
3           Forecasting Innovation Act of 2017 (Public Law  
4           115–25; 131 Stat. 91) is amended by inserting after  
5           the item relating to section 414 the following:

“Sec. 415. Weather and Earth System Modeling and Data Assimilation Work-  
force Innovation Program.”.

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