Main ways in which researchers could get funding for TEAMx

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In the UK

1) A NERC grant application under what NERC calls the "Discovery Science" scheme (more commonly called "responsive mode" or "standard grants"). The applicant simply makes a proposal for the research they want to do. There are different types of grant according to the amount of money. There may be multiple applicants, possibly from different UK institutions. There may be partners from other countries but they can't receive funding (except possibly for visits to the UK). It is unlikely that significant equipment would be funded through this route. Applicants may include access to a facility such as FAAM.

2) A case is made to NERC for a Strategic Programme Area (SPA) or a Highlight Topic (HT). There are occasional calls, not more than one per year. If approved, an open call is then issued for grant applications in the area of the SPA or HT. The main difference between SPAs and HTs is size - SPAs are bigger - up to £20m total - HTs are up to £4m. If an SPA or HT call is issued, the grant application process is similar to (1), but whereas (1) is for anything within NERC's remit, in this case the applications must address the SPA or HT call.

3) A case is made to NERC for a Joint Strategic Response (JSR). This is like (2) but half the money comes from another organisation, not NERC. In the TEAMx area the only plausible possibility is the Met Office. However the Met Office share could be in kind - effectively the Met Office declares its internal commitment to TEAMx and NERC then matches the commitment, making its share open to a grant application process rather like (1) and (2). There is a requirement that the grants coordinate with the Met Office activity.

NCAS funding is what NERC calls "National Capability". Essentially this allows NCAS to provide facilities (such as FAAM) and also allows a limited amount of NCAS science to be done without grants. NCAS could direct small amount of this towards TEAMx for NCAS staff to work on the programme. However this is quite limited.

There are very active discussions concerning directing some FAAM effort towards the long term planning and participation in large programmes such as TEAMx. These discussions are promising but it is so far unclear what funding this could release.

There are PhD studentship allocations to universities such as Leeds and through a competitive process, it could be possible to get one or more students working on TEAMx.

NERC: Natural Environment Research Council, one of the research councils within UKRI (UK Research and Innovation)
NCAS: National Centre for Atmospheric Science, one of the research centres supported by NERC
FAAM: Facility for Airborne Atmospheric Measurements, one of the facilities provided by NERC

In Austria

For individual researchers

1) An FWF grant application under the “Stand-Alone projects” scheme. FWF is the Austrian Science Fund and funds fundamental research. The applicant makes a proposal for the research they want to do. There can be only one PI, but part of the funding can be allocated to national research partners. There may be partners from other countries but they can't receive funding. There is no limit to the amount of funding that can be requested, but the number of required reviews scales with the project size (at least two reviews is the budget is within 400k EUR, one further review for each additional 200k EUR). Purchase of equipment is possible, but subject to considerable restrictions. Typical duration 3 years, cost-neutral extension of up to 1 year possible.

2) Gottfried and Vera Weiss Prize, sponsored by a private research foundation. Awarded every even year to a project in the field of meteorology. Administered by FWF, same procedures as Stand-Alone projects.

3) Several other FWF-sponsored individual grants, targeted to specific groups. Schrödinger Fellowships for young researchers, for a research period abroad and a return phase. Lise Meitner Programme (2 years) for incoming researchers from abroad or for reintegration of Austrian researchers. Hertha Firnberg Programme (3 years) for female post-docs and Elise Richter Programme (3 years) for female senior post-docs. All these programmes mostly fund researcher salary.

4) FWF START Programme and Wittgenstein Awards, resp. for outstanding young researchers and outstanding scholars. Given the level of support (around 1M EUR over about 5 years), they permit maintaining a small research group. For the START programme, purchase of equipment is possible under the same restrictions that apply to Stand-Alone projects. No known restriction for Wittgenstein Awards, but in this case the application is only possible after nomination by an entitled authority.

For research teams: National

5) An FWF application for a Research Group. These grants support 3-5 collaborating researchers, that can be based in different Austrian institutions. The group must be interdisciplinary. Funding is awarded for a maximum of 5 years and maximum of 1.5M EUR. Purchase of equipment is possible under the usual restrictions.

6) An FWF application for a Special Research Programme (SFBs). These grants support a core group of 5-15 researchers (30% female), at least 50% of which has to be based in a single Austrian research institution. The typical size is 1M EUR/year for up to 8 years (an interim review after 4 years decides on continuation). SFBs need to have an interdisciplinary component. Purchase of equipment is possible under the usual restrictions.

For research teams: International

7) FWF periodically issues calls for international cooperation projects, mostly bi- or tri-lateral joint projects funded in partnership with other funding agencies abroad. Such agreements currently exist with: Argentina, China, Czech Republic, France, Germany, Hungary, India, Israel, Japan, Luxembourg, Poland, Russia, Slovenia, South Korea, Switzerland, Taiwan. Agreements with regional funding agencies in the Flanders and in South Tyrol also exist. A special scheme is the D-A-CH programme (Germany-Austria-Switzerland). Proposals can be submitted to a lead agency, i.e. one of the three national funding agencies (DFG, FWF, SNF) on a rolling basis.

8) EUREGIO (European Region Tyrol-South Tyrol-Trentino) Research Funds. Sporadic calls, typically every two years. Targeted to collaboration among research institutions in the three participating regions. Administered by FWF, guidelines identical to Stand-Alone projects.

9) Research Fund of the Autonomous Province of Bolzano/Bozen (Italy). Sporadic calls, every three or more years. Partners do not have to be from South Tyrol, but proposed research must be relevant to the province. Funding is awarded only to partners based in South Tyrol-Tyrol-Trentino. No equipment.

In Germany

General remark: Most of the universities and research centers provide information about actual calls and offers from funding agencies on their homepage. It is recommended to use these opportunities. Important funding agencies are:

1) BMBF (Federal Ministry of Education and Research). The BMBF supports innovative projects and ideas in research through targeted funding programs. The spectrum ranges from basic scientific research, sustainable environmental development, to new technologies, but also structural research funding to Universities up to innovation promotion and technology transfer.

2) DFG (German Research Foundation). The German Research Foundation (DFG) supports science in all its branches through financial support for research projects as a self-governing organization of German science. The tasks of DFG include advising parliaments and authorities in scientific matters, coordinating basic research and its coordination with state research funding, and promoting scientific relationships abroad. The DFG pays special attention to the promotion of young scientists.

3) Stifterverband für die Deutsche Wissenschaft (Foundation Association). The purpose of the Stifterverband is to promote science and research. For this purpose, the association awards funding for the implementation of projects in science and research, education and training. The beneficiaries of the funds are universities, research institutes, other scientific institutions and organizations of science as well young scientists.

4) Volkswagen Foundation (VW Stiftung). The Volkswagen Foundation is a charitable foundation under private law. Its purpose is the promotion of science and technology in research and teaching. The foundation enables research projects in promising areas and helps scientific institutions to improve the structural conditions for their work.

5) Alexander von Humboldt Foundation. The Alexander von Humboldt Foundation is a non-profit foundation for the promotion of international research cooperation, established by the Federal Republic of Germany. It enables long-term research stays in Germany for highly qualified foreign academics and supports the resulting scientific and cultural connections.

In Canada

1) NSERC: the main funding source for physical scientists is the Natural Science and Engineering Research Council. NSERC awards five-year "Discovery" grants to academic researchers. The amount awarded is discretionary, so the funding allocated (generally $20k-100k/year) is usually much less than that requested. On the bright side, the success rate is high (~50%). Each researcher can only hold one Discovery Grant. This is a good funding source to support one or two students for TEAMx, but it won't support a field deployment.

NSERC provides two other network grants. One is "Strategic" Grants, targeted toward various subjects (e.g., nanotechnology, Arctic, etc.) that have strategic value to Canada. These require large-scale in-kind support from Canadian industry and/or government. They are highly competitive but could serve as a vehicle for collaboration with Environment and Climate Change Canada (ECCC). There are also "CREATE" grants, which are meant to stimulate world-class student training. These are also highly competitive and generally support around 10 graduate students. Fieldwork is viewed as a very positive training environment, so TEAMx could be attractive. However, both of these require the establishment of a research "network" of people from different Universities in Canada.

2) Canada Research Coordinating Committee, New Frontiers in Research Fund, International Stream. It enhances opportunities for Canadian researchers to participate in research with international partners. The International stream includes two mechanisms: joint funding calls with international agencies on topics of international relevance; and a dedicated fund to support participation of Canadian researchers within international teams in projects seeking funding from major global platforms. Through the second mechanism, up to $10 million per year for five years will be allocated specifically to support Canadian participation in international teams applying for funding through Horizon 2020 and Horizon Europe. This is a new funding scheme, announced in July 2019. First calls are foreseen in fall 2019.

3) Provincial funding (e.g., Fonds de Recherche Quebec Nature et Technologies, or FRQNT): some, but not all, provinces have their own grant foundations. In Quebec, that foundation is called FRQNT. The most common funding types are for new researchers ($40k over two years) and for research teams ($60k/year for three years). Generally, the project must hold benefits to Quebec, so it may not be appropriate for a field campaign on a different continent. Also, the modest funds may be insufficient to support a field deployment.

4) ECCC Grants and Contracts: If ECCC is on-board with this project, and first indications are positive on that front, they may be willing to put forth some funding to support research activities (students, postdocs, and/or instruments). Such funding from ECCC has been declining over the years, but if ECCC is sufficiently gung-ho about TEAMx, this could be a good option. It usually does not require a large proposal, and the funding can be significant if ECCC interest is strong.

5) Research network funding: some Canadian research networks are termed "Network Centres of Excellence" (NCEs). These receive major government funding ($5M/year) and have their own open funding calls. Currently, no NCEs focus on atmospheric science. University of Saskatchewan has an NCE-like program called Global Water Futures, directed by John Pomeroy. This project is mostly focused on hydrology but there is an atmospheric component. All of their funding calls are closed and only involve a handful of atmospheric scientists. The best avenue to pursue such funding would be through direct contact with John Pomeroy.

6) Industry collaboration: funding opportunities abound in Canada through industry collaborations. NSERC offers a scheme (called Collaborative Research and Development, or CRD grants) where they split the funding 50/50 with industry. There is also a program called Mitacs that supports students and postdocs collaborating with industry. This opportunity because will require a large degree of interest and investment from Canadian industry. It's unclear how TEAMx would attract such interest.

In Spain

1. The main source of funding is through the Central Governement, which opens a call yearly under two main lines "Research challenges" which correspond to some predefined areas (Climate change is included here) and "Knowledge Generation" (all other subjects). Projects are led by one institution with address in Spain, with 1 or 2 IPs (and projects can coordinate becoming subprojects of a main project including all of them). Money usually oscillates between 100 ke and 300 ke for a three-year individual project or subproject, which normally only allows for trip expenses, salaries and small instrumentation. Foreign researchers can participate individually as members of a (sub)project. If a large instrument or infrastructure is required, there are sometimes "Infrastructure" calls, but this is not on a regular basis.

2. Regional governments can provide funding too if the research subject is in their priority list. Normally these are shorter projects with a lesser amount of money.

3. Interreg programs are funded by the EU and are for projects having partners in bordering countries. In Spain this means with France and Portugal.

4. There are a number of programs to fund early-career researchers.

In Switzerland

1. National Institutions for Research and Innovation Promotion

The Research and Innovation Promotion Act (Federal Act of 14 December 2012 on the Promotion of Research and Innovation (RIPA)) designates the Swiss National Science Foundation (SNSF), the Swiss Academies of Arts and Sciences and Innosuisse as the organs responsible for promoting research in Switzerland. These organs receive federal subsidies through SERI for their activities in promoting research and innovation.

a) The Swiss National Science Foundation (SNSF)

The SNSF is the most important federal instrument for promoting research and nurturing the next generation of scientists. The private foundation, which was set up in 1952, supports scientific research at universities and independent research institutes. The main thrust of the SNSF's activity is the financing of high-quality individual projects in the sphere of independent basic research. At the SNSF, there are many different funding instruments that can change over time. On the SNF page there is the corresponding overview.

The promotion of young scientific talent is achieved through grants for future and advanced researchers (Careers) as well as exchange programmes with various partner countries (e.g. Lead Agency process, Bilateral Programmes).

The SNSF has also been assigned by the Federal Council and Parliament to carry out various research programmes:

- National Research Programmes NRP

The NRP are the federal government's research funding tool to support research projects that develop knowledge useful to guiding decisions and practices – and thereby contribute to solving current challenges. NRPs usually run for around five years. Since the instrument was first introduced, over 70 NRPs have been launched, covering a wide range of themes.

- National Centres of Competence in Research NCCR

The NCCRs are a research promotion tool of the Swiss government to ensure that competence centres and their networks are consolidated, with the goal of strengthening research in strategically important areas for Switzerland. In doing this, research institutions will be encouraged to focus and combine their strengths, and partnerships between the academic and extra-academic fields will be promoted. NCCRs are institutionally supported research projects of nation-wide importance. These projects are of high quality with a particular emphasis on interdisciplinary and innovative approaches within the disciplines. NCCRs should also engage in the transfer of knowledge, the promotion of up-and-coming talent and encourage the promotion of equal opportunities in research.

b) Innosuisse – Swiss Innovation Agency

Innosuisse is the Swiss Confederation's promotional body for science-based innovation. Its mission is to build bridges between research and the market with the aim of supporting and accelerating innovation processes. It works as a catalyst for innovation by bringing companies into contact with research institutes via innovation projects. Its tasks also include supporting science-based entrepreneurship and founding and establishing science-based companies. Innosuisse also supports the utilisation of knowledge and the transfer of knowledge and technology between institutes of higher education, business and society.

c) BRIDGE

BRIDGE is a joint programme conducted by the Swiss National Science Foundation (SNSF) and Innosuisse - the Swiss Innovation Agency. It offers new funding opportunities at the intersection of

basic research and science-based innovation, thereby supplementing the funding activities of the two organisations. - BRIDGE consists of two funding opportunities:Proof of Concept is aimed at young researchers who wish to develop an application or service based on their research results. These projects may target innovations of all kinds from all research areas.

- Discovery is aimed at experienced researchers who aim to explore and implement the innovation potential of research results. Only technological innovations that have a societal and economic impact will be funded.

2. Swiss University Conference (SUC)

   The SUC is the highest higher education policy body in Switzerland. In accordance with the Federal Constitution, it carries out joint coordination in the Swiss higher education system between the Confederation and the cantons. The SUC supports joint educational or research projects between the various academic universities, ETH and, since 2017, the universities of applied sciences.

3. Platform for Advanced Scientific Computing (PASC)

   The PASC is a structuring project supported by the Council of Federal Institutes of Technology (ETH Board) and, until 2017, by the Swiss University Conference (SUC). PASC started in 2013 and will last until 2020. PASC is coordinated by CSCS, the Swiss National Supercomputing Centre of the ETH Zurich, in collaboration with the Università della Svizzera italiana (USI) and with the other Swiss universities and the EPFL.

4. Ressortforschung of various federal offices

The Federal Administration initiates and supports scientific research, the results of which it needs to fulfil its tasks. This research carried out in the public interest is referred to as departmental research. The Federal Administration's research can cover practically all forms of scientific research, in particular from basic research through application-oriented research to development, e.g. in the field of setting up pilot and demonstration systems.

5. R&D Foundations

   All classic foundations under federal supervision have been registered in the electronic foundation register since July 1, 2006 - based on the Public Relations Act BGÖ of December 17, 2004.

In the USA

The main funding sources for US investigators are NSF, NASA, NOAA, DOE, and DOD.

The National Science Foundation (NSF) is likely the most promising source of funding for TEAMx, in particular the science sections within the Division of Atmospheric and Geospace Science (AGS), including Physical and Dynamical Meteorology (PDM), Atmospheric Chemistry (ATC), and Climate and Large Scale Dynamics (CLD). For a coordinated US effort in the TEAMx experiment that would entail use of the NSF Lower Atmosphere Observing Facilities that managed by NCAR, a Letter of Interest (LOI) is due at least three years prior to the anticipated experiment. The intent is to submit the LOI by the end 2019 with the information coming out the TEAMx workshop. The next step would be the submission of the science umbrella proposal, so called ‘scientific

program overview' (SPO), and the experimental design overview (EDO). There is a single annual deadline (January 15) for the submission of these documents to NSF and NCAR. For example, for an experimental phase in 2023, the corresponding deadline would be January 15, 2021. If the SPO and EDO review favorably, individual science proposals to NSF will be due later in fall 2021.

The National Aeronautics & Space Administration (NASA) has an annual call for proposals that could include topics of interest to the TEAMx community (https://science.nasa.gov/researchers/sara/grant-solicitations). The call is released mid-February and is known as "Research Opportunities in Space and Earth Sciences 2019 (ROSES-2019)". Typically for these calls, the use of space-borne data is highly encouraged (that is without the use of these data, proposals are likely not considered favorably). The deadline for proposals is typically around summertime.

National Oceanic & Atmospheric Administration (NOAA) Climate Program Office (CPO) typically has annual call for proposals that can be related to topics of interest to the TEAMx community (https://cpo.noaa.gov/Funding-Opportunities). CPO supports competitive research through three major program areas: Earth System Science and Modeling (ESSM); Climate and Societal Interactions (CSI) and Communication, Education and Engagement (CEE). The last call had letters of Intent due on 23 August 2019.

The Department of Energy (DOE) provides an opportunity to request the ARM Mobile Facility (AMF) for a field campaign (including ground-based and airborne platforms). The following website provides some details: https://www.arm.gov/research/campaign-proposal. Note the following statement on this website: "ARM provides use of facility resources for campaigns, but does not provide research funding. Research funding is necessary to support all investigator efforts, travel, and/or expenses. Approved campaigns for which research funding has not been obtained will be held for 1 year for the principal investigator to obtain funding; after that time, principal investigators must resubmit their proposals for approval."

In France

1) ANR (French National Research Agency).
The ANR is a public administrative institution under the authority of the French Ministry of Higher Education, Research and Innovation. The agency funds project-based research carried out by public operators cooperating with each other or with private companies.
It offers a number of funding instruments.
Within the Generic Call for Proposals (AAPG), the ANR offers three instruments for funding collaborative research projects:

- between public entities in a national or international context (PRC or PRCI respectively),
- between one or more academic or public-sector research laboratories and one or more companies involved in R&D (PRCE).
- to enable younger generations to develop their own research topics, the Agency also offers the JCJC instrument within the AAPG, which is targeted at young researchers awarded PhDs less than 10 years ago.

The ANR also offers funding instruments and implements specific programmes to support and strengthen research partnerships between public and private-sector players (LabCom and LabCom consolidation, Industrial chairs, Challenge, Carnot programme). Meanwhile, the ANR funds or organizes collaboration programmes with national institutional partners. Financed by the DGA and organized by the ANR, the Astrid and Astrid Maturation programmes dedicated to dual civilian and military research benefit from mixed ANR-DGA monitoring. The ANR has also a specific instrument to respond to urgent needs for research on specific themes, including subjects relating to events or natural disasters of exceptional magnitude: Flash calls.
Collaborating with foreign funding agencies, the ANR takes part in specific international calls for proposals (ERA-NET, ERA-NET Cofund, EJP, Article 185, JPI, bi- or multilateral calls) to promote cooperation between French teams and the best European and international teams on specific strategic research themes. It only

finances the participation of the French teams. The ANR also offers two specific calls for proposals to facilitate access by French researchers to large-scale European or international funding programmes and strengthen their leadership: MRSEI (to help researchers constitute a scientific network with a view to submitting a project to a European or international call for proposals) and T-ERC (which offers a further chance of success to young researchers who have not been awarded funding under the European Research Council).
Its budget was 350 million Euros in 2005 when it was funded and has risen to 955 million euros as of 2009. Funding per project: O(100 keuros).

2) LEFE programme (Les enveloppes fluides et l'environnement)
It is a programme organized by CNRS/INSU and funded by several national agencies (Ademe, CEA, CNES, CNRS, IFREMER, INRIA, IRD, METEO, MTES and Mercator-Ocean). It aims at supporting scientific research on the atmosphere, the ocean, their coupling and their interactions with other components of the climatic system. Funding per project: O(10 keuros)

3) EC2CO programme (Écosphère continentale et côtière)
This is a similar programme organized by CNRS/INSU and funded by several national agencies (CNRS, ANDRA, BRGM, CNES, IFREMER, IFSTTAR, INRA, IRD, IRSTEA and METEO-FRANCE). It aims at supporting scientific research at the interface of hydrology, ecology and bio-geochemistry, such as water resources, water and soil resources contamination.

4) PNTS programme (Programme national de télédétection spatiale)
This is another similar programme organized by CNRS/INSU and funded by several national agencies (CNRS, CNES, IGN, IRD and METEO-FRANCE). It aims at developing use of satellite remote-sensing to study the earth system (surface, internal, ocean, atmosphere).

5) There are also calls from local governments, mostly for projects with a relatively short term local economical impact.

6) Some institutes have their own funding capability. For example METEO-FRANCE can fund or co-fund PhD studentship allocations, participation to a field experiment, etc.