

Trading Global Catastrophes: NATO's Science Diplomacy and Nuclear Winter

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Abstract

This essay explores the reception of ‘nuclear winter’ at the North Atlantic Treaty Organization (NATO). This response is paradigmatic of how scientific predictions can work as stimuli for science diplomacy activities, and either inflate or deflate these forecasts’ public resonance. Those who elaborated the theory in the early 1980s predicted that the environmental consequences of a future nuclear conflict would have been catastrophic; possibly rendering the earth uninhabitable and leading to the extinction of humankind. This prospect was particularly problematic for the Western defence alliance, since it was difficult to reconcile with the tenets of its nuclear posture, especially after the 1979 Dual Track decision, engendering concerns about the environmental catastrophe that the scientists predicted. Thus, NATO officials refrained from commenting on nuclear winter and its implications for the alliance’s deterrence doctrine for some time in an effort to minimize public criticism. Meanwhile, they progressively removed research on nuclear winter from the set of studies and scientific debates sponsored by NATO in the context of its science initiatives. In essence, NATO officials ‘traded’ the promotion of these problematic studies with that of others more amenable to the alliance’s diplomacy ambitions.

Keywords

International scientific collaboration, NATO, nuclear winter, nuclear age, public diplomacy, science diplomacy

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Forty years ago, scientists considered the prospect of global cooling resulting from a nuclear exchange as likely as how they consider global warming today. They thus debated whether a new war would trigger a drastic reconfiguration of the earth's environment. Nobel Prize-winning chemist Paul Crutzen (together with his colleague John Birks) termed these global environmental changes a 'nuclear twilight'. Massive fires and smoke caused by nuclear explosions, Crutzen and Birks claimed, would spread dust through the atmosphere, blackening the skies and plunging the world and its inhabitants into darkness. A group of US scientists, comprising the then rising scientific celebrity Carl Sagan, extended this investigation further, forecasting these effects as long-term and changing climate irreversibly. According to the group's study, there would no longer be enough sunlight reaching the planet's surface, and the deriving alterations to seasonal weather patterns could even lead to a new Ice Age. The group introduced the term 'nuclear winter' to underscore that nuclear explosions would unsettle more than just dusks and dawns.¹

The history of this new concept epitomizing the predicted global environmental catastrophe associated with a nuclear war has captured the attention of many scholars, especially given that the debate on nuclear winter brought experts from a number of scientific fields into the political arena during a tense phase of the Cold War. Sagan and his associates wished their conclusions to positively inform international relations and put a positive spin on disarmament negotiations. Their critics debated nuclear winter too, claiming the environmental consequences of a nuclear war to be more localized, and thus indirectly suggesting that playing up these effects aimed to advance the stances of anti-nuclear protesters and give them greater visibility.²

Drawing on the literature exploring this scientific (and political) controversy, this essay asks how competing diplomacy ambitions informed the promotion and demotion of international collaborative research on nuclear winter. Today, we often use the term 'science diplomacy' to describe the ways in which institutions promote collaborative scientific initiatives to strengthen their foreign relations (as 'science FOR diplomacy'), and to illuminate how governments and intergovernmental organizations routinely facilitate the promotion of collaborative projects

1 P. Crutzen and J. W. Birks, 'The atmosphere after a nuclear war: Twilight at noon', *Ambio*, 11 (1982), 114–25; republished in J. Peterson and D. Hinrichsen (eds) *Nuclear War: The Aftermath* (Oxford 1982), 73–91, on 78; R.P. Turco, O.B. Toon, T.P. Ackerman, J.B. Pollack and C. Sagan, 'Nuclear winter: Global consequences of multiple nuclear explosions,' *Science*, 222 (1983), 1283–92. Crutzen received his Nobel Prize in 1995.

2 For instance P. Rubinson, 'The global effects of nuclear winter: Science and antinuclear protest in the United States and the Soviet Union during the 1980s,' *Cold War History*, 14, 1 (2014), 47–69; P. Rubinson, *Redefining Science: Scientists, the National Security State, and Nuclear Weapons in Cold War America* (Boston 2016); W.M. Knoblauch, *Nuclear Freeze in a Cold War: The Reagan Administration, Cultural Activism, and the End of the Arms Race* (Boston 2017); L. Badash, *A Nuclear Winter's Tale. Science and Politics in the 1980s* (Cambridge 2009); M. Dörries, 'The politics of atmospheric sciences: "Nuclear Winter" and the global climate change,' *Osiris*, 26 (2011), 198–223; S. Weart, 'The public and climate change,' in *The Discovery of Global Warming* (online edn). Available at: https://history.aip.org/climate/public.htm#L_M014.

that align to their foreign policy objectives.³ Promoting science across borders, however, may also equally warp the trajectory of novel research, propelling subjects that align with diplomacy objectives and serving efforts to bring international research in line with specific foreign policy goals.⁴

The reception of nuclear winter in the context of the North Atlantic Treaty Organization (NATO) opens a particularly fruitful window on such foreign affairs dynamics. Established in 1949 as a defence coalition to repel a Soviet attack to Western Europe, over the years the alliance evolved into a transnational political organization and even a major sponsor of cultural and scientific initiatives. As recent research has shown, NATO's science and environmental programmes were an essential diplomacy device to address the alliance's integration problems.⁵ A look at nuclear winter, in contrast, draws special attention to the tensions inherent the alliance's science diplomacy, since the prospect of a global environmental catastrophe soon became a key argument against NATO's strategic posture, thus energizing their officials' efforts to remove a prickly item from the alliance's research agenda.

The debate of nuclear winter thus shaped NATO's sponsorship and public diplomacy strategies, especially as it took place at a critical junction for the political life of the alliance marked by the 1979 Dual Track decision catering for the deployment of Pershing II and Cruise nuclear missiles in Western Europe, and the deriving 'Euromissiles crisis' further weakening public support to NATO's posture across the continent. In this context, the unfolding scientific debate elicited a number of responses within the alliance, making it more reliant on scientists casting doubts on nuclear winter, and US Department of Defense (DoD) reports echoing their criticism.

Based on a copious amount of documents from the NATO archive,⁶ the essay starts out with a short outline of the genesis and development of NATO's science programme between the 1950s and 1980s. It then shows how new assumptions about nuclear winter formed in the early 1980s and how those were popularized by scientists and journalists. Part three explores how nuclear winter moved onto NATO's agenda, showing that its administrators agreed to stall the funding of studies on the predicted global catastrophe to be derived from nuclear exchange, and that they removed nuclear winter from the list of scientific subjects worth sponsoring to avoid giving greater resonance to this notion. It also shows that scientists sponsored by the alliance independently organized scientific meetings in

3 On this definition see AAAS/Royal Society, *New Frontiers in Science Diplomacy. Navigating the Changing Balance of Power* (London 2010), 11–14.

4 I use the word 'warping' in line with literature on Cold War scientific patronage. See: P. Forman, 'Behind quantum electronics: National security as basis for physical research in the United States, 1940–1960', *Historical Studies in the Physical and Biological Sciences* 18 (1987), 149–229; N. Oreskes, 'Science in the origins of the Cold War', in N. Oreskes and J. Krige (eds) *Science and Technology in the Global Cold War* (Cambridge, MA 2014), 11–24.

5 S. Turchetti, *Greening the Alliance: The Diplomacy of NATO's Science and Environmental Initiatives* (Chicago 2018).

6 NATO Archive at NATO headquarters in Brussels, Belgium (NATO from now on).

which nuclear winter studies were openly criticized, thus framing an alternative understanding of these environmental impacts. As I argue, the demotion of research funding as well as the organization of counter-conferences served as a key ‘public diplomacy’ device for NATO that aimed to propagandize scientific views aligned to the alliance’s posture.⁷ The final section shows how an official NATO response on nuclear winter was made available only when competing scientific and security policy narratives emerged seeking to demonstrate that NATO’s strategy appropriately balanced détente and deterrence.

Science for Diplomacy at NATO: Contours of the Alliance’s Science Programme, 1950s to 1970s

Authoritative learned societies such as the Royal Society and the American Association for the Advancement of Science claim NATO to have been one of the international organisations ‘instrumental in the history of science diplomacy’.⁸ This is because from 1957 the alliance’s main decision-making body, the North Atlantic Council (NAC), agreed to set up a science programme that developed over the next 50 years.⁹ The contours of this initiative have only recently been explored, given the recent release of NATO’s records that re-appraise the alliance’s history.¹⁰ The new documents show particularly well its investment to propel the advancement of science in member countries in order to address the shortcomings of their diplomatic relations. NATO pioneered science diplomacy, because its officials sought to use the promotion of science as a diplomatic channel (or ‘back-channel’), especially in critical moments of the alliance’s history when the allies could only agree to disagree. So, when nuclear winter emerged as an item of scientific debate in the international arena, NATO had already become a major patron for the sciences, especially in Western Europe.

NATO science was *for* diplomacy even before a funding programme was set up. Its establishment was a response to the political upheaval that followed the Suez

7 On NATO’s public diplomacy see L. Risso, *Propaganda and Intelligence in the Cold War. The NATO Information Service* (London / New York 2014). On science as a vehicle for public diplomacy during the Cold War see Audra J. Wolfe, *Freedom’s Laboratory. The Cold War Struggle for the Soul of Science* (Baltimore 2018).

8 AAAS/Royal Society, *New Frontiers in Science Diplomacy*, 2.

9 I am drawing here on my recent book. A short synopsis is in: ‘Diplomacy by other means? NATO’s science sixty years on’, features on *NATO Review* (26 March 2018). Available at: www.nato.int/docu/review/articles/2018/03/26/diplomacy-by-other-means-natos-science-sixty-years-on/index.html (accessed 3 May 2020). For a less recent outlook see J. Krige, ‘NATO and the strengthening of Western science in the Post-Sputnik Era’, *Minerva*, 38, 1 (2000), 81–108.

10 This is not to say that historians have overlooked NATO as a transnational organization, but that they have focussed more on its military and political dimensions. See T. A. Sayle, *Enduring Alliance: A History of NATO and the Postwar Global Order* (Ithaca, NY 2019). M. Trachtenberg, *A Constructed Peace* (Princeton, NJ 1999); L. Nuti (ed.) *The Crisis of Détente in Europe: From Helsinki to Gorbachev, 1975–1985* (London 2008); Ronald E. Powaski, *The Entangling Alliance: The United States and European Security, 1950–1993* (Westport, CT 1994); G. Schmidt (ed.) *A History of NATO. The First Fifty Years* (New York, NY 2001). See also the many works of Lawrence Kaplan including *NATO Divided, NATO United: The Evolution of an Alliance* (Westport, CT 2004).

Crisis, and the open disagreement between the alliance's three major powers (US, Britain and France) on intervention in the Middle East. In an effort to find long-term solutions to the political crisis, the NAC tasked the foreign ministers of Italy, Norway and Canada (as 'Committee of Three' or 'Three Wise Men') to make recommendations on how to strengthen the alliance as a political entity.¹¹ One of their proposals eventually led to the setting up of a NATO Science Committee, chaired by a newly appointed Assistant Secretary General for Scientific Affairs, and comprising scientists from member states (typically government science advisers or heads of national research councils) meeting twice a year at NATO headquarters. The committee took responsibility for elaborating a science programme that in the 1960s had evolved to include the offer of fellowships to early career scientists wishing to study abroad, the funding of collaborative research projects, and the organization of workshops.¹²

In its early days, the diplomatic ambitions of NATO's programme widely overlapped with its security agenda. Given the Cold War's geopolitical framework and the Soviet launch of Sputnik, a major emphasis of early science initiatives was on security and surveillance. Much in line with this agenda, the largest NATO grant went to a consortium of laboratories to study how to improve the tracking of orbiting satellites, while collaborative projects in oceanographic and meteorological studies were heavily funded, given their implications for the alliance's operational tasks.¹³

NATO's science programme configured the alliance as one of the most prominent science patrons in Western Europe over the next decade. And its political crisis, following the failure of the Multilateral Force and the French withdrawal from its allied military command, further revealed the importance of the science programme as a way to consolidate the alliance's political integration. A new Committee on the Challenges of Modern Society (CCMS), set up in 1969, explicitly underlined these ambitions by coupling NATO's investment in science with one aiming to address environmental issues. US President Richard Nixon now sought to stir NATO towards a socially- and environmentally- oriented 'Third Dimension' (i.e. parallel to political and military ones) in an effort to evade the abovementioned divisive issues of military coordination. He also aimed to stifle criticism of the US administration for the Vietnam war and take the diplomatic focus away from the report filed in 1967 by the Belgian Minister of Foreign Affairs Pierre Harmel indicating that the alliance should play a greater role in East-West détente efforts. Indeed, as the allies agreed to champion environmentalism through the CCMS, also to 'face-lift' NATO's public image, the debate on these efforts seem to wither away.¹⁴

11 The Committee submitted the report to the NAC in December 1956. An electronic copy is available on the NATO website (https://www.nato.int/archives/committee_of_three/index.htm).

12 Turchetti, *Greening the Alliance*, Ch. 1.

13 *Ibid.*, Ch. 2.

14 On the CCMS and its activities see E. Hatzivassiliou, *The NATO Committee on the Challenges of Modern Society, 1969–1975: Transatlantic Relations, the Cold War and the Environment* (Basingstoke

By the early 1970s, NATO's new emphasis on environmental issues also stimulated a radical shift in the Science Committee's initiatives. Phasing out much of its surveillance-focused research, the Committee began to promote original research on environmental themes, funding new studies and setting up sub-groups (or panels) devoted to the study of industrial pollutants and their toxicological effects, often in conjunction with CCMS actions.¹⁵ It also targeted the problem of climate change in its research programme. At a 1972 meeting, MIT expert Carroll Wilson presented a far-reaching study, *Man's Impact on the Global Environment*, seeking to chart global climatic variations and atmospheric pollution by particle load.¹⁶ By then, new studies by Swedish atmospheric chemist Paul Crutzen had also revealed how nitrous dioxide-releasing substances routinely used in the industry impacted on the world environment by depleting the ozone layer, therewith damaging the atmosphere's upper strata.¹⁷ Over the course of the decade, further studies and conferences sponsored by NATO followed.¹⁸

With the 1980s approaching, the Science Committee was thus prepared to play a major role in promoting further research on 'planetary climate systems' to keep in line with major developments in other international organizations.¹⁹ Such studies, scientists and officials hoped, would also make NATO a key contributor to the World Climate Research Programme recently launched by the World Meteorological Organization and the International Council of Scientific Unions.²⁰

It was at that point, however, that several scientists associated long-term climatic changes with the environmental consequences of a nuclear conflict, thus producing a controversy that was soon in the public eye and that indirectly targeted NATO's nuclear posture. In turn, the Committee members became warier of further funding environmental work that had so far been so central to their promotion of NATO's collaborative research, also as an alternative track of its diplomacy.

2017); J. Hamblin, 'Environmentalism for the Atlantic Alliance: NATO's experiment with the 'Challenges of Modern Society'', *Environmental History*, 15 (2010), 54–75. For an overview of the context in which Nixon's proposal for the Committee emerged see J.B. Flippen, 'Nixon, train and the birth of modern American environmental diplomacy', *Diplomatic History*, 32, 4 (2008), 613–38.

15 Turchetti, *Greening the Alliance*, Chs. 5. See also J. Hamblin, 'Environmentalism for the Atlantic Alliance: NATO's experiment with the 'Challenges of Modern Society'', *Environmental History*, 15 (2010), 54–75.

16 The presentation was elaborated in the context of the MIT-sponsored Study of Critical Environmental Problems (SCEP). SCEP, *Man's Impact on the Global Environment. Assessment and Recommendations for Action* (Cambridge, MA 1970).

17 P.J. Crutzen, 'The influence of nitrogen oxides on the atmospheric ozone content', *Quarterly Journal of Royal Meteorological Society*, 96 (1970), 320–25.

18 Turchetti, *Greening the Alliance*, Ch. 6.

19 Proposal for phasing out the special panel programme on air-sea interaction, 1 March 1982, Annex V to AC/137-D/800, NATO.

20 Weart, 'The public and climate change'.

Science and Protest: The Problem of Nuclear Winter

By 1980, a number of new international collaborative projects either focused, or indirectly referred to, the environmental and climatic effects of nuclear explosions. This was partly due to the availability of data on emissions from nuclear tests now used as proxy for exploring past and present global climatic variations. For instance when the Californian physicist Louis Alvarez and his associates completed a paleo-climatic study on the dust produced by asteroid impact in connection with the extinction of dinosaurs, they compared dust data to the amounts of Carbon-14 injected in the atmosphere as result of nuclear testing.²¹ And during a 1973 NATO conference on atmospheric pollution, scientists from the UK Meteorological Office compared real and projected data on nitrous oxide emissions from flight and nuclear tests to demonstrate that the supersonic airliner Concorde would not massively pollute the upper atmosphere.²²

The circumstances of the Cold War from the late 1970s renewed tensions between blocs, especially given the hawkish stances of the UK Prime Minister Margaret Thatcher and the US President Ronald Reagan, while nuclear arsenals grew up to an unprecedented number of warheads. Hence world climate and environmental experts now focussed more on nuclear weapons to consider if a nuclear exchange could cause sudden and global environmental changes.

Extending the ozone layer study started in the 1970s, Crutzen now researched the climatic variation resulting from emissions released in a nuclear exchange. In 1982 he and his British colleague John Birks showed that wild fires generated by nuclear explosions would produce a 'photochemical smog' that could englobe the whole earth. These fires would release so much dust to obscure sunlight and generate a 'twilight effect'.²³ Crutzen and Birks also drew attention to the smoke caused by burning forests, which would reduce average sunlight penetration and darken the Northern Hemisphere.

Experts who focussed instead on sudden climatic variation events on other planets, also showed an interest in the study. US cosmologists James B Pollack and Owen Toon, for instance, had looked into climate-changing catastrophes in both Venus and Mars concluding that sudden and irreversible variation in climate of a planetary scale had occurred because of the release of substances such as carbon dioxide.²⁴ These conclusions led them to collaborate with three other colleagues, the astronomer Carl Sagan, and the atmospheric scientists Richard P Turco and Thomas P Ackerman to explore further the environmental impacts of

21 L. Alvarez et al., 'Extraterrestrial cause for the cretaceous-tertiary extinction', *Science*, 28 (1980), 1095–108. See Badash, *A Nuclear Winter's Tale*, 50–52 (and note 14).

22 S. Turchetti, 'The UK government's environmentalism: Britain, NATO and the origins of environmental diplomacy', in J. Agar and J. Ward (eds), *Histories of Technology, the Environment and Modern Britain* (London), 252–70 (2018), on 263–5.

23 P. Crutzen and John W. Birks, 'The atmosphere after a nuclear war: Twilight at noon', 78.

24 O.B. Toon and J.B. Pollack, 'Atmospheric aerosols and climate', *American Scientist*, 68 (1980), 268–78, on 275. On the polemic see also M. Dörries, 'In the public eye: Volcanology and climate change studies in the 20th century', *Historical Studies in the Physical and Biological Sciences*, 37 (2006), 87–125.

a nuclear conflict. They further examined what Crutzen and Birks had researched concluding that their forecast was too optimistic. A landmark scientific article on 'The Long-Term Atmospheric and Climatic Consequences of a Nuclear Exchange' (later dubbed as Turco, Toon, Ackerman, Pollock & Sagan (TTAPS) from the author's surnames) highlighted that the nuclear 'twilight' could irreversibly change the earth's climate.²⁵

First presented to the US National Academy of Sciences (NAS) in June 1982, the study showed how dust produced in a nuclear exchange would not only reduce sunlight penetration but also produce long-term effects on the atmosphere and the biosphere. It also paid greater attention than Crutzen and Birks had done to the soot caused by the burning of cities, which the TTAPS study considered as another environmental factor defining long-term changes, especially since sooty smoke could attenuate sunlight.²⁶ A darkened atmosphere would at first produce critical changes in seasonal weather patterns and then make it difficult, if not impossible, to successfully carry on agricultural activities. If extended over a sufficient long period, the reduced sunlight would also impact on climate making seasons increasingly colder, setting the circumstances for a new Ice Age.

The nuclear winter hypothesis now paved the way to a public controversy. From 31 October 1983, a two-day conference took place at the Sheraton Hotel in Washington DC, which attracted 500 people between scientists, activists and journalists. The so-called 'Halloween conference' marked the moment, when the notion of nuclear winter moved at the centre of world politics, re-affirming the catastrophic impacts of a nuclear exchange and, in so doing, lending support to those protesting against nuclear weapons.²⁷ While preparing the conference Sagan and his associates deliberately looked for ways to maximise public exposure, also in conjunction with a public relations firm that helped projecting the debate on nuclear winter beyond the scientific community.²⁸

In December 1983, Sagan went on to capitalize on these catastrophic projections in the context of a forum organized at the US Senate Caucus Room. He also wrote for the non-governmental US Council on Foreign Relations' magazine *Foreign Affairs* pushing the scientific debate on nuclear winter into a space traditionally occupied by diplomats and international relations experts.²⁹ Sagan cautiously argued that 'subthreshold' strikes would not necessarily produce a global catastrophe.³⁰ But could a nuclear conflict be limited to a subthreshold exchange? The TTAPS article set a baseline of 5000 megatons as upper limit to avoid global catastrophe, which meant a release of about a third of the warheads available in

25 R.P. Turco, O.B. Toon, T.P. Ackerman, J.B. Pollack and C. Sagan, 'Nuclear winter: Global consequences of multiple nuclear explosions', *Science*, 222 (1983), 1283–292.

26 Turco et al., 'Nuclear winter', 1283.

27 P.R. Ehrlich, C. Sagan, D. Kennedy and W.O. Roberts, *The Cold and the Dark. The World After Nuclear War* (London 1984). See also Badash, *A Nuclear Winter's Tale*, 66.

28 On the PR campaign see Knoblauch, *Nuclear Freeze in a Cold War*, 42–5.

29 C. Sagan, 'Nuclear war and climatic catastrophe: Some policy implications', *Foreign Affairs*, 62 (1983), 257–92. On Sagan's meeting in Washington D.C. see Rubinson, 'The global effects of nuclear winter', 48.

30 'Panel on atmospheric and climatic consequences', in Ehrlich et al., *The Cold and the Dark*, 106.

1983. Avoiding nuclear winter meant, in essence, preventing the escalation that a nuclear attack made virtually inevitable.³¹

This framed NATO as well given the alliance's role as a nuclear power in Western Europe. In particular, Sagan's and Crutzen's conclusions called directly into question the alliance's strategic posture at a critical junction in its history. Following the Dual Track decision of 12 December 1979, the allies had deliberated that, unless the Warsaw Pact agreed on a mutual limitation of intermediate-range and medium-range ballistic missiles (track 1), NATO would modernize its long range theatre nuclear forces through the deployment of the US missiles Gryphon, Pershing II and Cruise to counter the Soviet build-up of modernized SS-18 and SS-20 (track 2).³² The decision reignited the dormant debate on NATO's role in East-West détente efforts that the Harmel Report had started, but effectively extended it in the public arena as a deployment of new nuclear missiles was vibrantly opposed by anti-nuclear movements across Western Europe.

The 'Euromissiles crisis' typified the following years as from 1983, the Pershing II was deployed in West Germany, Italy and the UK, while Belgium and the Netherlands continued to debate on the new nuclear option. This debate worsened East-West relations too, since, while leaders in Western Europe viewed the decision to deploy the missiles as mainly as an effort to restore the balance of deterrence, Soviet leaders perceived it as asymmetrical, especially since Pershing II could reach deep into Russian territory and, in their view, enable NATO to perform a first-strike 'decapitation'.³³ This fear was decisive in the set of events that led Soviets military personnel to mistake the 1983 NATO command and control exercise *Able Archer* for a real nuclear attack thus preparing for launching a retaliation which would have likely led to nuclear exchange.³⁴

Crutzen's scientific findings on nuclear winter lent further support to those who viewed NATO's Dual Track decision as dangerous if not entirely bankrupt. NATO officials continued to defend it as in line with both détente and deterrence efforts, but as Sayle has recently showed, citizens in Western Europe were far more sceptical, perceiving Reagan administration as 'trading bellicosity for the language of arms control' and NATO allies uncritically following the US administration.³⁵ Many now feared a nuclear escalation that could not save Western Europe from

31 Ehrlich et al., *The Cold and the Dark*, 106. Critics of the nuclear winter scenario later attacked these projections. See Badash, *A Nuclear Winter's Tale*, 249.

32 On the decision see L. Nuti, 'The origins of the 1979 dual track decision— A survey'. In L. Nuti (ed.) *Crisis of Détente, 57–71* and K.S. Readman, 'Conflict and cooperation in intra-alliance nuclear politics: Western Europe, the United States, and the genesis of NATO's dual-track decision, 1977–1979', *Journal of Cold War Studies*, 13, 2 (2011), 39–89.

33 Gorbachev likened the Pershing II to 'a pistol [pointed] at our head,' D. Holloway, 'The dynamics of the Euromissile Crisis, 1977–1983', in L. Nuti, F. Bozo, M-P. Rey and B. Rother (eds) *The Euromissiles Crisis and the End of the Cold War* (Washington, DC 2015), 88. See also Readman, 'Conflict and cooperation in intra-alliance nuclear politics', 45.

34 On the incident see for instance A. Manchanda, 'When truth is stranger than fiction: the Able Archer incident', *Cold War History*, 9, 1 (2009), 111–33.

35 Sayle, *Enduring Alliance*, 205–11.

global catastrophe. The findings also heightened the anxieties of NATO protesters, thereby fuelling the peace movements sweeping across Europe and climaxing in one of the largest demonstrations in West German history in Bonn's Hofgarten on 23 October 1983 (just a week before the 'Halloween' conference).³⁶

Equally worryingly from NATO's point of view, Sagan's widely publicized scientific prediction of nuclear winter increasingly linked up with bleak cinematic portrayals of nuclear war. On 20 November 1983, the ABC broadcast *The Day After*, a film showing how an American family living in the Midwest was exterminated in a nuclear attack. A televised ABC debate followed the film and gave an opportunity to Carl Sagan to publicly discussing his predictions with a former US Defense Secretary, Robert McNamara, as well as the current Secretary of State, George Schulz, and one of his predecessor, Henry Kissinger. The following year, the BBC film *Threads* more vividly depicted the consequences of a NATO nuclear strike, and included a fictional version of nuclear winter, which caused a sensation in many countries.³⁷

Reactions in the political arena followed suit. After *Threads* was broadcast, Labour Party officials in Britain openly attacked NATO. And the former UK Defence Secretary (and now shadow Foreign Secretary) Denis Healey stated that nuclear winter had 'changed the whole debate about defence and foreign policy'.³⁸ To sum up, nuclear winter made the alliance officials anxious; something further proven by the fact that even before new research reached the public arena, their demotion from the NATO science programme had been actively encouraged.

Making Science Fit with Foreign Policy: NATO's Response to Nuclear Winter

In public, NATO desisted from commenting on nuclear winter until 1986, also to avoid creating further public enmity towards the alliance in light of Dual Track and the ensuing Euromissiles crisis. Yet, behind closed doors in the first half of the 1980s the alliance's science activities were being re-shaped to stall the promotion of research subjects that had the potential of further displaying how catastrophic a NATO nuclear attack could be. Then, as the Euromissiles crisis approached, scientists that NATO had sponsored that far independently promoted scientific events aiming to display the conclusions reached in the TTAPS study as fallacious.

A new NATO Assistant Secretary General for Scientific Affairs, the French physicist Robert Chabbal, had been appointed in 1980 partly in an effort to

36 James M. Markham, 'German missile protests: Mixed signals for Kohl', *New York Times* (24 October 1983). See also Sayle, *Enduring Alliance*, 211–12.

37 On *The Day After* see Knoblauch, *Nuclear Freeze in a Cold War*, 61–5. On *Threads*: Jude Rogers, 'Here come the bombs: The making of *Threads*, the nuclear war film that shocked a generation', *New Statesman* (17 March 2018).

38 A. Wood et al., 'Party committed to staying in NATO and expelling All US nuclear bases', *The Times* (4 October 1984).

instigate a rapprochement between French and US administrations.³⁹ He initiated a major restructuring of the Science Committee to dispel negative perceptions of NATO's scientific activities as essentially aiming to give a 'human face' to what the public perceived as an otherwise bellicose alliance. Many from within the scientific community now believed that even NATO's chiming with 'green' research had been a PR operation rather than an effort to embrace ecological thinking.⁴⁰

Chabbal made several propositions to strengthen the alliance's public diplomacy efforts, including better amalgamating NATO's own promotion of science, environmental actions and culture through the creation of a new North Atlantic Foundation for Science, Environment and Culture (which, however, never saw the light of the day).⁴¹

In addition, he and his colleagues in the Science Committee also agreed on delaying projects that could propel public condemnation of the alliance. In 1981, with the debate on Dual Track now raging in Western Europe, the committee rejected a proposal for a psychology-oriented conference on 'The Social and Military Consequences of Nuclear Deterrence'.⁴² The US representative Edward E David, formerly Nixon's science adviser, warned about its 'political implications' and stressed that if the workshop was ever to take place, candidates ought to be screened to avoid that they propagandize anti-NATO views. David also vibrantly opposed a proposal for an investment in social sciences research, since he was concerned that this would attract scholars with stances critical to NATO.⁴³

A similar restraint typified the Science Committee decisions on proposals to promote NATO's climate change studies that could lend support to exploring 'sudden' global variations, fearing that this would lead to focus on those deriving from a nuclear exchange. In 1981, Chabbal instructed setting up a 'Survey Group on Geosciences' to plan ahead new research. He could not avoid inviting scientists who had led past climate research (including the director of the UK Meteorological Office, John T. Houghton, and the University of Kiel professor of oceanography John Woods). But he also asked two geoscientists to join the new group to prevent the study of sudden climate variations to be foregrounded in its recommendations: the Icelandic Gumundur E. Sigvaldason and the French Claude J. Allègre (Institute de Physique du Globe, Paris).⁴⁴ Both held views on climate change congenial to NATO, partly because of their recent research on volcanic

39 Scientific Affairs Division, *NATO Science Committee Yearbook* (Brussels 1982), 17–9. On Chabbal's appointment and US/France relations see Turchetti, 'Diplomacy by other means? NATO's science sixty years on . . .'.

40 Turchetti, *Greening the Alliance*, Ch. 7.

41 Measure to improve the public presentation of NATO's activities in the fields of science, the environment and culture, 18 June 1982, PO/82/74, NATO.

42 Science Committee, Decisions Sheet, 30 December 1981, AC137-DS30, NATO.

43 Science Committee, Decision Sheet, 9 July 1984, AC137-DS38, NATO.

44 Science Committee, Decision Sheet, 17 July 1981, AC/137-DS/29, NATO; R. Chabbal, Activities of Survey Groups, 1 June 1982, AC/137-D811, NATO.

eruptions.⁴⁵ Another proxy scientists used for nuclear explosions, volcanoes could trigger climatic changes temporarily affecting the earth's average temperature, but these volcanologists claimed that they were incapable of altering climate suddenly or permanently. The implication was clear: if volcanoes could not, nor could nuclear explosions.

During the survey panel meeting of October 1981 Sigvaldason and Allègre played down major global climatic effects associated with human activities. They argued instead that carbon dioxide released from the volcanic active rift zones was higher than any anthropogenic activity recorded in history and had not produced irreversible climatic variations.⁴⁶ Not only did their conclusions countered those of TTAPS cosmologists Pollack and Toon, but helped to slow down plans for a NATO investment on sudden climate changes and nuclear winter studies. The Science Committee eventually approved the survey group's compromise to set up a new panel devoted to 'Global Transport Mechanisms' and Chabbal appointed Allègre as its chair. The panel would promote studies encompassing global geophysical processes between core earth and upper atmosphere, but it would not focus on climate or its sudden changes.⁴⁷

Just how much NATO's science initiatives now aimed at stalling research on the environmental effects of nuclear war also became obvious in the proceedings of the newly established panel. The Canadian representative in the Science Committee noted an 'apparent imbalance' in favour of workshops on geological topics, while those with a focus on climatic change had yet to be approved.⁴⁸ In particular, panel members agreed to postpone more than once the completion of a workshop on 'abrupt' climate change claiming that they needed to have more details on the specific themes.⁴⁹ Members also agreed to defer a proposal for another workshop on climate modelling proposed by the Belgian meteorologist André Berger of the Catholic University (Louvain), allegedly due to budget constraints.⁵⁰ Even when the climate change-sceptic Allègre resigned as panel chair, the group of new experts called in to propel its activities seemed unwilling to focus more on the scientific topic of the day. Because of the fear that nuclear winter would direct their attention, NATO equally demoted research on climate change; something that unnerved the German representative in the Science Committee. The alliance was not doing enough to promote climate change research (e.g. on 'acid deposition in the atmosphere'), he noted.⁵¹

45 Their presence had also to do with a recent polemic on the eruption of the volcano *Soufrière* in Guadeloupe. See Turchetti, *Greening the Alliance*, Ch. 7.

46 R. Chabbal, Report on Geo Sciences Survey Group, 13 November 1981, ASG.SEA(81)327, NATO (copy in Isidor Isaac Rabi papers, Box 39, Folder 5, US Library of Congress, Washington, DC, USA).

47 Science Committee, Decision Sheet, 4 May 1982, AC/137-DS31, NATO.

48 The representative was the physicist Robert E. Bell of McGill University. Science Committee, Decision Sheet, 29 April 1983, AC/137-DS/34, NATO.

49 Special Programme Panel on Global Transport Mechanisms, 19 February 1984, AC/137-D/869, NATO.

50 Ibid.

51 Science Committee, Decision Sheet, 30 November 1984, AC137-DS39, NATO.

At one point the panel appeared ready to promote the study of nuclear winter, but then shut it down once and for all. Berger (who meanwhile had replaced Allègre as panel chairman) seemingly felt reassured enough to take Crutzen's proposal for a NATO workshop on 'the global atmospheric transport of dust and soot (*including a discussion of nuclear winter*) [*italic mine*]' as an item at the next panel meeting. Members approved the proposal, even if with a depleted budget (half of what Crutzen had requested).⁵² In less than one year, however, the topic vanished from the list of NATO workshops. Indeed panel members eventually agreed that they were 'unable to recommend support of the application in its present form'.⁵³ In a similar vein, members also removed studies on the recent nuclear disaster of Chernobyl, as the panel made no mention of the disaster and lessons to be learnt in the field of Global Transport Mechanisms (as one Science Committee member later noted).⁵⁴

Meanwhile, a group of scientists with important ties to the alliance criticized the TTAPS forecast thus taking to Western Europe a debate already raging in the US. The Italian nuclear physicist Antonino Zichichi in particular now launched an initiative aiming to remove the catastrophic predictions once and for all from the scientific arena. By then a rising star in the discipline, Zichichi had worked at the CERN in Geneva for several years before establishing a new international centre devoted to 'scientific culture' in Erice (Sicily). He had enjoyed an impressive stream of NATO grants up until that point.⁵⁵ In 1980, however, he launched an 'International Seminar on Nuclear War'. Sponsored by the World Federation of Scientists, the new seminar was meant to open a dialogue between experts on disarmament and other concerned about the prospect of a nuclear conflict. According to its organizers, the workshops sought solutions to nuclear issues without being 'anti-nuclear in an emotional sense'.⁵⁶

So while NATO kept quiet publicly about nuclear winter and stalled funding its research, the seminars became an authoritative voice against the TTAPS projections. They also offered a stage to speakers like the US nuclear physicist Edward Teller who defended NATO's posture and attacked pessimistic views on the environmental consequences of nuclear war. Teller, the controversial 'father' of the H-

52 The proposed funding was for 825.000 Belgian Francs. Special Programme Panel on Global Transport Mechanisms, 22 January 1986, AC/137-D947, NATO.

53 Special Programme Panel on Global Transport Mechanisms, Summary Record of Meeting, 1 August 1986, AC/137-D/969, NATO. No further explanation was given in the document, although there may be an explanation in the files of NATO's Assistant Secretary General for Scientific Affairs.

54 Science Committee, Decision Sheet, 1986, AC137-DS45, NATO.

55 For the NATO workshops on particle physics, 1969; processes at high energy, 1970; fundamental interactions, 1971; highlights in particle physics, 1972; the laws of hadronic matter, 1973. For an overview on the diplomacy implications of earlier NATO workshops see P. Verschuere, 'Cécile Morette and the Les Houches summer school for theoretical physics; or, how Girl Scouts, the 1944 Caen bombing and a marriage proposal helped rebuild French physics (1951–1972)', *British Journal for the History of Science*, 52, 4 (2019), 595–616.

56 W. Barletta and H. Wegener, 'Introduction' in H. Wegener W.A. Barletta (eds) *Averting Disaster: Science for Peace in a Perilous Age – The Erice International Seminar on Nuclear War and Planetary Emergencies: from 1981 to 2008* (Singapore 2010), 3–14, on 9.

Bomb and Reagan's outspoken science adviser, attended the Erice seminars every year, presenting a strong stance in favour of increasing the US defence budget and developing new defence systems to face the Soviet threat. Not only did Teller's own variety of pacifism chimed with nuclear deterrence, but the physicist had already played a controversial role at NATO in the early 1960s, trying to stir its research programme towards controversial environmental warfare research. He was also one of the first scientists to challenge the TTAPS predictions back at home.⁵⁷

The Erice seminars covered the environmental effects of nuclear conflict already during the first three workshops, but devoted most of the 1984 meeting to nuclear winter. It mainly featured scientists who had reservations about the TTAPS predictions, and Zichichi summoned in the opening statement that there were serious doubts about the reliability of the data Sagan and his colleagues had used.⁵⁸ Most speakers did not openly dismiss that a nuclear war would have serious environmental impacts, but they showed distrust of the global catastrophe scenario the TTAPS portrayed. Teller aptly summarized the invitees' general scepticism: 'Today "nuclear winter" is claimed to have apocalyptic effects. Uncertainties in massive smoke prediction and in meteorological phenomena give reason to doubt this conclusion'.⁵⁹

The invited scientists attacked the nuclear winter scenario from various angles. A retired research engineer from Oak Ridge National Laboratory disputed the TTAPS data on smoke released in nuclear wildfires.⁶⁰ Teller's colleagues at the Lawrence Livermore National Laboratory rejected instead projections on how these fires would alter the atmosphere, also claiming that the troposphere would be marginally affected.⁶¹ Data from the laboratory's simulation centre also questioned projections on global cooling. The earth would freeze but less than what TTAPS predicted.⁶²

Other contributors drew a line between Crutzen's original work, which they judged reliable, and the TTAPS research, considered derivative and flawed. One

57 E. Teller, 'Openness: A contribution from scientists', in Etim and S. Stipcich (eds) *How to Avoid a Nuclear War*, 206–25. On Teller's role at NATO see Turchetti, *Greening the Alliance*, Ch. 4; on his contrasts with Sagan see Rubinson, 'The global effects of nuclear winter', 56–8; Knoblauch, *Nuclear Freeze in a Cold War*, 46–9.

58 A. Zichichi, 'Opening statements', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 3–7.

59 E. Teller, 'The widespread after effects of nuclear war', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 316–27, on 316. On 'spreading doubts' in the context of scientific debates and their implications, there is a burgeoning literature. See for instance N. Oreskes and E.M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York, NY 2010).

60 C.H. Kearny, 'Fire emissions and some of their uncertainties', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 201–10.

61 J. Penner and L.C. Haselman, Jr., 'Smoke inputs to climate models: Optical properties and height distribution for nuclear winter studies', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 211–19.

62 M.C. Mac Cracken and J.J. Walton, 'The effects of interactive transport and scavenging of smoke on the calculated temperature change resulting from large amounts of smoke', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 260–79.

scientist openly attacked Crutzen though, claiming his estimates to be wrong. Crutzen (who was amongst the speakers, but whose article did not feature in the proceedings) replied on the spot. The scientist's information was 'much biased on the low side. . .', he stated.⁶³ Teller ignored Crutzen's point and wrapped up the general criticism on nuclear winter, recalling its study as politically-motivated: 'highly speculative theories of worldwide destruction [. . .] used as a call for a particular kind of political action serve neither the good reputation of science nor dispassionate political thought'.⁶⁴ His words caused a sensation as they appeared on *Nature* while the seminar was ongoing.⁶⁵

The only participant who confirmed the TTAPS conclusions was the Soviet physicist Vladimir V. Aleksandrov and, in the context of the Erice adversarial proceedings, this seemed to give substance to speculations that nuclear winter was actually a Soviet conspiracy aiming to undermine US and NATO defence plans. Aleksandrov reiterated, based on his computer simulations, that nuclear winter could be 'severe' although he acknowledged that more work was needed to understand the circulation of soot and the consequences of large-scale fires.⁶⁶

Following the end of the seminar, the RAND sovietologist Leon Gouré, who was present at the meeting, filed two reports on nuclear winter with the DoD's own nuclear organization, the Defense Nuclear Agency. Gouré's research sought to demonstrate that the whole nuclear winter hypothesis was a Soviet conspiracy explicitly set up to strengthen the opposition to NATO in Western Europe. Aleksandrov and his Soviet colleagues endorsed Western work on nuclear winter mainly because they aimed to use it as 'a political and propaganda opportunity to influence Western scientific and public opinion and to restrain U.S. defense programs'.⁶⁷ Following private conversations in Erice with Aleksandrov, Gouré had concluded that his computer model was 'crude'; the result of a 'crash effort' to accommodate Crutzen's and Sagan's results.⁶⁸

The Erice meetings produced more controversy. In March 1985, Aleksandrov mysteriously disappeared in Madrid,⁶⁹ and the mystery heightened diplomatic tensions across the Iron Curtain as a member of the security team responsible for the Soviet delegation also went missing. The Soviet scientists invited to the

63 Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 250.

64 Teller, 'The widespread aftereffects of nuclear war', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 316–27, on 325.

65 E. Teller, 'Widespread after-effects of nuclear war', *Nature*, 310 (1984), 621–4.

66 V.V. Aleksandrov, 'Update of climatic impacts of nuclear exchange', in Newman and Stipcich (eds) *The Nuclear Winter and the New Defense Systems*, 280–287 and debate at p. 331. Rubinson has framed these activities in Soviet anti-nuclear mobilizations in 'The global effects of nuclear winter', 64–7.

67 L. Gouré, 'Soviet exploitation of the "Nuclear Winter" hypothesis', US Defense Nuclear Agency report DNA-TR-84-373, 5 June 1985, 3. *The Times'* Matt Ridley has recently reiterated this claim in newspapers' articles. See M. Ridley, 'Russian Spies' role in the Great Green Hoax', *The Times* (19 February 2018).

68 Gouré, 'Soviet exploitation of the "Nuclear Winter" hypothesis', 59.

69 G. Rispoli, 'Frío y oscuridad: La colaboración sobre el invierno nuclear y la desaparición de Vladimir Aleksandrov', in L. Camprubí, X. Roqué and F. Sáez De Adana (eds) *De La Guerra Fría al Calentamiento Global* (Madrid 2018), 257–80.

1985 Erice seminar thus cancelled their participation and Zichichi, now at the centre of a public storm, denied that he knew about the Soviet renunciation. But it had become clear to many, including the Soviets presumably, that in making invitations to Erice Zichichi had a soft spot for US scientists who endorsed Reagan's defence policy.⁷⁰

While much remains to ascertain on the mysteries surrounding the Erice seminars, they certainly offered an opportunity to cast doubts on the nuclear winter scenario, thus reducing, in combination with the demotion of prickly research topics, the impact that the TTAPS predictions could have on NATO's public and intergovernmental diplomacy. Now a silent NATO attuned to developments on the other side of the Atlantic, where the US DoD was coming under increasing pressure to review and report on the environmental impacts of nuclear exchange. And only the publication of DoD reports extensively drawing on the Erice proceedings made NATO officials more eager to comment on nuclear winter.

Nuclear Winter Back at NATO (Thanks to the DoD)

In 1983, Reagan's administration had (as NATO) happily committed to remain silent on nuclear winter, but had to revise this stance since several congressional hearings indicated the need to explore its policy implications in greater depth. Eventually the 1984 Defense Authorization Act compelled the DoD to complete a public report, and the DoD in turn agreed to appoint a NAS review panel to look into the effects on the atmosphere of a nuclear exchange. The 200 pages 1985 NAS report by and large echoed the TTAPS concerns,⁷¹ even if it was certainly more cautious in stressing the uncertainties distinctive of models and predictions. The study was however instrumentally used in a much shorter (17 pages) report prepared by the Secretary of Defense, Caspar Weinberger, and entitled 'The Potential Effects of Nuclear War on the Climate'. It claimed that these uncertainties ultimately justified the current DoD security policy. The conclusions irked some of the US congressmen even more, since some of the key issues at stake, especially the biological effects of a nuclear exchange, had been blatantly overlooked. They thus succeeded in compelling the DoD to elaborate a more extensive review, and provide a new report by 1 March 1986.⁷² Not only did the new DoD report reiterate

70 As an officer of the Italian Communist Party remarked. F. Valls, 'La desaparición de Alexandrov planeó sobre la 'cumbre'', *El País* (26 August 1985); F. Valls, 'La URSS justifica su ausencia de la reunión de Erice por la falta de seguridad', *El País* (23 August 1985) (I am thankful to Rispoli for providing copies of these articles).

71 National Academy of Sciences, *The Effects on the Atmosphere of a Major Nuclear Exchange* (Washington, DC 1985). The NAS response was influential in making some of the early proponents, such as Turco, more doubtful about their early predictions. See S.L. Thompson and S.H. Schneider, 'Nuclear winter reappraised', *Foreign Affairs*, 64, 5 (1986), 981–1005. A commentary is in Rubinson, 'The global effects of nuclear winter', 55.

72 A summary of the first DoD report is available as 'Nuclear winter: The view from the US defense department', *Survival*, 27, 3 (1985), 130–4. The second's content is available as US General Accounting

the same points about uncertainty but actually it now drew more extensively on the yet-to-published presentations on the effects of fire and smoke delivered by Teller's colleagues at Erice; Teller's recent *Nature* article dismissing the TTAPS conclusions; and Gouré's recent interviews with Aleksandrov. Gouré reports in particular were used to claim limitations in the Soviet research, 'primarily involving computer modelling capabilities' and 'exaggerating conclusions for propaganda purposes'.⁷³

The report also reiterated the effectiveness of current security provisions, while shifting the emphasis of the nuclear winter debate towards the need for more rapidly modernizing defense systems in the Western bloc. In particular, the report underscored that the Strategic Defense Initiative (SDI, or Star Wars), which Reagan had announced two years earlier and had in Teller one of its main advocates, was the main solution that the DoD intended to pursue to address the nuclear winter scenario. Nuclear exchange would not be producing catastrophic environmental effects if the space shield that the initiative intended to materialize could destroy enough missiles on their path to target. Sagan, who had clashed with defense officials at congressional hearings and was sceptical of SDI, was clearly angered by the DoD use of nuclear winter 'as a soapbox for promoting Star Wars'.⁷⁴

Now the same scientific conclusions and policy propositions unveiled in the Pentagon reports travelled to NATO, and informed the formulation of an official stance on nuclear winter.⁷⁵ So, as the proposed NATO workshops on nuclear winter discussed earlier in the article were being postponed or cancelled, the alliance officials increasingly viewed the DoD position as justifying being more outspoken (notwithstanding the recent killing of a NATO scientific debate on nuclear winter).

In late 1985 the US political scientist Robert E Osgood (School of Advanced International Studies, Johns Hopkins University) and the German diplomat Henning Wegener (NATO Assistant Secretary General for Political Affairs) prepared a NATO report on nuclear deterrence for the UN General Assembly. Echoing the DoD conclusions, the study acknowledged that the 'issue of global environment effects of nuclear war' was a grave one, but rejected that the prospect made nuclear deterrence pointless. Osgood and Wegener now claimed 'intra-war deterrence' to 'facilitate a rapid termination of conflicts at the lower possible level

Service, 'Nuclear winter: Uncertainties surround the long-term effects of nuclear war', Report GAO-NSIAD-86-62, March 1986, 27. On the congressional process see: J. Scherr, 'Law: Coming to grips with nuclear winter', *Environment: Science and Policy for Sustainable Development*, 27, 8 (1985), 4-40,

73 GAO, 'Nuclear winter: Uncertainties surround the long-term effects of nuclear war', 28.

74 GAO, 'Nuclear winter: Uncertainties surround the long-term effects of nuclear war', 13, 30. On Sagan see J.R. Dickenson, 'Sagan, defense officials clash on nuclear winter', *The Washington Post* (15 March 1985).

75 N. Ashford, 'American delegation will brief NATO on strategy before Star Wars debate', *The Times* (4 March 1985). One British MP, James Hill, indicated Star Wars as 'lessening the need of a retaliation (and incidentally reducing the appalling likelihood of a nuclear winter)'. *The Times* (19 December 1985).

of destruction compelling'. Referring tangentially to Star Wars, the authors recalled that increased defence systems' accuracy would reduce the risk of escalation.⁷⁶

On 14 April 1986, even the NATO Secretary General, the Briton Lord Carrington (Peter Alexander Rupert Carington), felt inclined to mention nuclear winter. He claimed in a speech at the *Palais des Congres* in Brussels that the scientific prediction needed not to affect NATO's nuclear posture as the progression from 'a selective Western use of nuclear weapons' to full nuclear exchange could be prevented through advanced defence systems. Presumably mindful of the 1983 Able Archer incident, he also emphasized the exclusion of 'automaticity' from the decision-making process. Escalation could be averted, and doom-and-gloom projections by concerned scientists like Sagan and anti-nuclear campaigners marching in European capitals were mistaken.⁷⁷

By the end of the 1980s competing positions on scientific conclusions and security policy solidified, while nuclear winter came to occupy a less relevant space in public and NATO debates. Two (loyal) collaborators of Zichichi have attributed its disappearance to its flaws as a scientific theory 'based on crude and deficient climate models'.⁷⁸ Yet more recent research has actually arrived at predictions similar to those set out in the TTAPS study, hence suggesting that the research had some merit.⁷⁹

So it seemingly vanished from the centre of the political debate not because of its scientific content, but rather for the global transitions that instigated the end of the Cold War, and, drawing on nuclear winter predictions too, propelled arms control. The rapprochement between Reagan and Gorbachev which had started already in 1985 led two years later to the first treaty instructing the removal of intermediate-range nuclear forces (INF), including the Euromissiles. The INF treaty also kick-started a comprehensive disarmament process that in less than a decade halved the global number of nuclear warheads. So these momentous events markedly redefined the possibility of a global nuclear escalation, also rendering an environmental catastrophe deriving from nuclear exchange far less likely.

Conclusions

With nuclear winter no longer a problematic item in NATO's research agenda, the alliance could increasingly invest in climate change studies as some of the representatives in the Science Committee members and sponsored climate experts had hoped for. In 1989 the Global Transport Mechanisms panel dissolved and was replaced by a new

76 R. Osgood and H. Wegener, 'Deterrence: the western approach', NATO Information Service (NATIS), 1986. Available at: archives.nato.int/uploads/r/null/1/3/137821/0285_Deterrence_the_Western_approach_1986

77 Lord Carrington on the Defense of freedom, 14 April 1986. See: archives.nato.int/uploads/r/null/1/4/140836/STATEMENT_CARRINGTON_1986-04-14_BIL.pdf

78 Barletta and Wegener, 'Introduction' in Wegener and Barletta (eds) *Averting Disaster: Science for Peace in a Perilous Age*, 9.

79 See Rubinson, *Redefining Science*, 208–13.

group promoting the study of Global Environmental Change.⁸⁰ Many researchers, including Crutzen, could now take part in its proceedings, which comprised the completion of several workshops from 1991. By the time this happened, however, NATO's role changed considerably as, with the end of the Warsaw Pact, the defense alliance once born to counter the threat of a Soviet invasion was now prepared to play a new role globally through its enlargement east-ward and interventions in distant places (from Kosovo to Afghanistan). The focus on global environmental change quite evidently now chimed with NATO's new diplomatic objectives.

Nuclear winter, by contrast, virtually disappeared from the scientific debate. This was partly a result of its fading in the political arena due to the comprehensive reduction in nuclear weapons. This led to reconfiguring future global environmental threats as almost entirely associated with other issues such as ozone depletion and carbon dioxide-induced global warming. It is telling that even recent statistical work on climate science overlooks both global cooling and nuclear winter.⁸¹ That said, some of the early proponents of nuclear winter have been equally anxious about the far more environmentally destructive nuclear weapons available today, hence denouncing that even a local exchange between India and Pakistan would trigger devastating global environmental effects.⁸²

The debate on nuclear winter also echoes recent scientific controversies, such as that on global warming, with which they share a similar landscape in science and diplomacy domains and the emphasis on scepticism and doubts as polarizing factors. This essay shows that in facing old and new predictions about worldwide catastrophes, whether due to nuclear winter or global warming, we tend to monitor scientific consensus as if these predictions, once they gain the necessary support from the scientific community, will prompt decision-makers to act. But this article suggests the opposite to be equally true. Diplomats and officials within national and transnational organizations routinely mobilize scientific evidence that aligns to worldviews and political ambitions that strengthen their diplomacy agenda. The NATO case illustrated here shows how the defence alliance sought to shape the scientific debate on nuclear winter through promoting studies that would divert attention to other scientific topics and deferring the study of the environmental consequences of nuclear war. Removing the prospect of a global catastrophe aimed to reduce the criticism towards the alliance's strategic posture and thus use the science NATO promoted as a vehicle for public diplomacy too.

In particular, this essay has displayed a two-pronged diplomacy approach. On the one hand, NATO officials avoided commenting on the controversial nuclear winter scenario while offering support to competing research that downplayed the environmental consequences of nuclear war, and, more generally, kept anything nuclear

80 NATIS, 'A NATO Special Programme on the Science of Global Climate Change', Press release, 89 (18), 18 May 1989, NATO.

81 For instance J. Li, M-H. Wang and Y-S. Ho, 'Trends in research on global climate change: A science citation index expanded-based analysis', *Global and Planetary Change*, 77 (2011), 13–20.

82 B. Toon, A. Robock and R. Turco, 'Environmental consequences of nuclear war', *Physics Today*, 61, 12 (2008), 37.

(psychological consequences, nuclear disasters like Chernobyl, etc.) outside the realm of fundable NATO studies. On the other, NATO-sponsored scientists like Zichichi, with the assistance of Teller (who had also informed the alliance's science initiatives in the past) independently organized the Erice seminars, which cast doubts on the predicted environmental consequences of nuclear war. I have also shown how the official endorsement of these scientists' stances by the DoD, as well as the displaying of the SDI as a persuasive security solution to the nuclear winter scenario, was a decisive factor in persuading NATO officials to offer a commentary on nuclear winter while, at the same time, removing studies that might have revealed the merit of competing views from the alliance's science programme.

Of course this is a version of events by and large reliant on the documentation currently available, and the DoD reports may not have been the only factor shaping an official NATO position on nuclear winter. But it is now plain to see that in the context of the nuclear age the verification of a global environmental catastrophe deriving from nuclear exchange did not rest entirely with the scientific evidence available. Diplomatic ambitions informed it too, to the point that even winters and dawns (at least those of a nuclear variety) seemed at one point to crucially depend on the relations between the Western governments and officials trading their significance and meanings.

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