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CONTENTS

Session 3: Effects on agroecosystems

Session 4: Effects on natural biosystems

Legal aspects of the marine science on climate change

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ABSTRACT. – Oceans and seas are key components in climate systems. The strong need for more specific knowledge and its systematic delivery and application, including in relation to climate effects on marine environment, led to the recent adoption of the the UN Decade of Ocean Science for Sustainable Development (2021-2030). From an international law of the sea perspective, the increasing marine scientific research activities and the use of novel technologies rise the question on the adequacy of the current applicable regulatory framework. This paper focuses on the main legal aspects of marine science on climate change and call for a paradigm-shift: from unilateralism to multilateralism in the interests of mankind.

INTRODUCTION. – International law and climate science have always been in complementary tension with each other, and each influences the progressive development of the other. Accordingly, the 2015 Paris Agreement states that "[a]ccelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development [art.10 (5)]". Particularly, marine science relies on the assumption that oceans and seas are constantly exposed to climate effects which challenge their ecosystems. On June 2019, the United Nations proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030) to support efforts to improve scientific understanding and "adapt strategies and science-informed policy responses to global change ocean community to plan for the next ten years in ocean science and technology to deliver, together, the ocean we need for 'the future we want".

Because of oceans are a key component in climate systems, scientific research activities at sea has increased more and more in recent years. In their efforts to carry out marine climate research activities, States (and

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their national scientists) have contended with several legal uncertainties. Rights and duties of States to conduct marine scientific research on climate change, including the deployment or use of any observing installations and equipment in different maritime zones, are mainly governed by the international law of the sea, codified by the 1982 UN Convention on the Law of the sea (UNCLOS).

This paper focuses on the main legal aspects of the marine science on climate change. In more general terms, the topic related to legal aspects of scientific research activities is carried out within the research agreement between the Law Department (University of Pisa) and the National Institute for Nuclear Physics - National South Lab (INFN-LNS), under the scientific direction of Prof. Simone Marinai (University of Pisa) and with the collaboration of the Interdipartimental Centre of Law and Frontier Technologies (DETECT, University of Pisa). Responsibility for any error or omission lies exclusively with the author.

MARINE SCIENTIFIC RESEARCH: OVERVIEW OF THE INTERNATIONAL LEGAL FRAMEWORK. – UNCLOS generally regulates the use of the oceans and seas and of their natural resources. UNCLOS Part XIII is specifically devoted to the regulation of marine scientific research. Variable factors determine the applicable law to such research activities, mainly depending on *who* conducts the scientific research, *where* it is conducted and *what* such activities at sea are.

As for *who* conducts scientific research at sea, actors may be mainly three: coastal State; and/or, other researching States, and/or (directly or indirectly) a competent international organization. The legal situation changes according to whether coastal State and researching State(s) have signed a research agreement or whether coastal State is a State Part to a competent international organization.

As for *where* scientific research is conducted, it is generally adopted a zonal-management approach to the regulation of scientific activities at sea. Briefly, as for internal waters, they are on the landward side of the baseline of the territorial sea (Art. 8 UNCLOS), while for the case of archipelagic States, UNCLOS provides a specific regime ruled by its Part IV; as for the territorial sea, its breadth is up to 12 nautical miles, measured from baselines (Art. 3 UNCLOS); as for the contiguous zone, if declared by the coastal State, its breadth is up to 24 nautical miles, measured from baselines (Art. 33 UNCLOS); as for the economic exclusive zone (EEZ), if declared by the coastal State, its breadth is up to 200

nautical miles, measured from baselines (Art.57 UNCLOS); as for the continental shelf (CS), its breadth is up to 200 nautical miles, measured from baselines. All parts of the sea that are not included in the EEZ, in the territorial sea or in the internal waters of a State (or in the archipelagic waters of an archipelagic State), are high seas (Art. 86 UNCLOS), while the Area is the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction (Art. 1 and Part XI UNCLOS).

As for *what* research activities at sea are, applicable law mainly depends on whether they are considered as marine scientific research or non-marine scientific research. Different regulations are indeed provided for activities carried out at sea that have as their scientific object the marine environment (*i.e.*, marine scientific research), from those that have the same scientific object (marine environment) but are not carried at sea, such as through remote satellites systems. Applicable law is different also for activities carried out at sea, but that have as their scientific object, for example, the astronomical observation (and not the marine environment).

Research activities on climate change effects on the marine environment may be included in the concept of marine scientific research. Therefore, UNCLOS Parts XIII regulates the coastal State jurisdiction as well as other researching State rights and obligations in relation to such activities on climate change.

THE REGULATION OF MARINE SCIENTIFIC RESEARCH WITHIN NATIONAL JURISDICTION: COASTAL STATE CONSENT-REGIME APPLICABLE TO INTERNAL WATERS, ARCHIPELAGIC WATERS AND TERRITORIAL SEA. – Coastal State jurisdiction within its internal waters, archipelagic waters, and territorial sea is absolute. Any kind of research and survey activities must be conducted with the express consent of the coastal State and subject to any conditions it imposes. This normally implies the adoption of domestic procedures for granting licences to permit its national scientists as well as scientists of a foreign State to conduct marine scientific research on climate change within these waters in conjunction with local scientists.

Coastal State control over research and survey activities in its territorial sea is further reinforced by other rules, not included within its Part XIII. Such rules state that a passage of a foreign vessels through a territorial State is considered as a "non-innocent passage" when the foreign ship carries out research and/or survey activities without the

prior authorization of the concerned coastal State. Further, in straits used for international navigation and in archipelagic sea lanes, foreign ships may not carry out any research or survey activities without the prior authorization of the States bordering straits during their transit passage or archipelagic sea lanes passage.

Coastal State consent-regime applicable to EEZ and CS. – A coastal State has a general right to regulate, authorize and conduct marine scientific research in both EEZ and CS (art. 246 UNCLOS; See also arts. 56.1 (b) (ii) and 77 UNCLOS). At the same time, UNCLOS promotes marine scientific research conducted by the scientific community in the common interests of the international community. In this sense, coastal State has a general obligation to grant its consent in "normal circumstances" for research carried out "exclusively for peaceful purposes in order to increase scientific knowledge of marine environment for the benefit of all mankind" (Art. 246 (3) UNCLOS). In relation to the consent in "normal circumstances", coastal State has a due diligence obligation not to delay or deny it unreasonably by adopting appropriate domestic rules and procedures.

Which circumstances should be considered as "normal circumstances" are not specified by the UNCLOS. According its art. 246 (5), a coastal State may, in its discretion, withhold consent for the conduct of marine scientific research in the EEZ and on the CS, in four specified cases if: a) it is of direct significance for the exploration and exploitation of natural resources, whether living or non-living; b) it involves drilling into the continental shelf, the use of explosives or the introduction of harmful substances into the marine environment; c) it involves the construction, operation or use of artificial islands, installations and structures referred to in articles 60 and 80 UNCLOS (see below); d) it contains inaccurate project information or if the researching State or competent international organization has outstanding obligations to the coastal State from a prior research project.

The request by the researching State or a competent international organization to conduct marine scientific research must be submitted to the coastal States at least six months in advance of the expected starting date of the research activities with a full description of the research project.

In turn, the conduct of the coastal State in response to requests for consent to conduct scientific research in its EEZ or CS is that to grant,

in normal circumstances, its consent (expressly or implicitly; art. 252 UNCLOS) for marine scientific research projects by other States or competent international organizations to be carried out in accordance with the Convention (art. 246 (3) UNCLOS).

If a coastal State is a member of or has a bilateral agreement with a competent international organization, which intends to undertake, directly or under its auspices, a research project in that State's EEZ or CS, the coastal State is presumed to have granted its consent for the project to be executed if it approved the project at the time the international organization took the decision to undertake the project and it has not expressed any objection within four months of the notification of the project to it by the organization. This provision is especially relevant for research projects which require access to the maritime areas of several coastal States.

Once costal State grants consent to marine scientific research, the authorization is not on a *carte-blanche* basis. When undertaking marine scientific research in the EEZ or CS of a coastal State, researching States and competent international organizations are subject to a series of obligations (art. 249 UNCLOS). In particular, they are required, *inter alia*, to ensure the right of the coastal State to participate in or be represented in the project, especially on board research vessels and other craft or scientific research installations, when practicable, without payment of any remuneration to the scientists of the coastal State and without obligation to contribute towards the costs of the project. Suspension or cessation of marine scientific research activities may be required by the coastal State if research activities are not being conducted in accordance with the information communicated (*i.e.*, suspension). On the other hand, cessation can be envisaged mainly in two cases: firstly if, after a suspension, the situations are not rectified within a reasonable period of time; or, secondly, if non-compliance with the provisions amounts to a major change in the research project (art. 253 UNCLOS).

Following completion of the research, the researching State has a few obligations, including providing the coastal State, at its request, with the preliminary reports and final results and conclusions; access to all data and samples derived, including assistance in their assessment and interpretation. Furthermore, researching State should make internationally available the research results. Finally, after the research is completed, scientific research installations or equipment should be removed, unless otherwise agreed.

With respect to the removal of offshore installations or structures, UNCLOS underlines that any installation that has been abandoned or disused shall be removed to ensure safety of navigation, while having, at the same time, due regard to fishing, the protection of the marine environment and the rights and duties of other States. In addition, appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed. Specifically, the International Maritime Organization (IMO) Assembly Resolution on *Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone* defines the standards to be followed by the coastal State when making decisions regarding the removal of abandoned or disused installations and structure.

Regulation of marine scientific research in international maritime spaces: High seas and the Area. – UNCLOS ensures that not only coastal States, but also landlocked and other geographically disadvantaged States, have the right to conduct marine scientific research in the high seas, including on the water column beyond national jurisdiction. This refers to a water column beyond EEZ, if a State established it; or beyond territorial sea, if a State, like Italy, decided to not establish any EEZ, leaving (almost) all superjacent waters above the continental shelf as high seas. Freedoms of high seas include the freedom of scientific research pursuant to art. 87 UNCLOS, which is not limited to marine scientific research but also extends to all kind of research and survey activities. While the freedom of scientific research is to be exercised with due regard for the interests of other States in their exercise of the freedoms of the high seas, and also with due regard for the rights related to activities in the Area, marine scientific research at high seas is subject to more specific requirements related to the promotion of international cooperation, the creation of favorable conditions and publication and dissemination of information and knowledge (arts. 242-244 UNCLOS). Beyond the national continental shelf, the UNCLOS provides for a specific regime (*i.e.*, the common heritage mankind-regime) applicable to the International Seabed Area, *i.e.*, the Area.

The legal content of the principle of the common heritage of mankind only applies to administering the resources of the Area (UNCLOS Part XI). It involves a specific mechanism regime governed by an international organization (the International Seabed Authority, ISA) entitled to

act on behalf of mankind in the exercise of rights over the resources. All States have the right to conduct marine scientific research in the Area, in conformity with Part XI and exclusively for peaceful purposes and for the benefit of mankind. The ISA has indeed been established to organize and control activities of exploration for, and exploitation of, the mineral resources of the Area. In relation to such activities, the ISA has a general responsibility to promote and encourage the conduct of research relating to the Area and its mineral resources, and to coordinate and to disseminate the results of such research and analysis, when available, with particular emphasis on research related to the environmental impact of activities in the Area (art. 142 UNCLOS). As for non-minerals, marine scientific research seems to be largely left to self-regulation. Limits are related to the requirements in high seas, *i.e.*, those related to the promotion of international cooperation, the creation of favorable conditions and publication and dissemination of information and knowledge.

THE DEPLOYMENT AND USE OF INSTALLATIONS AND/OR EQUIPMENT: THE ARGO FLOATS ON CLIMATE CHANGE. – Rights and obligations and related conditions ruled by UNCLOS for the conduct of marine scientific research in any maritime areas apply also to the deployment and use of installations and equipment for such research in the area concerned (art. 258 UNCLOS). It is also specified that research installations and equipment do not possess the status of islands, and thus they have no territorial sea and their presence does not affect the delimitation of any maritime zones (art. 259 UNCLOS). As specified above, coastal States may withhold consent regarding the use of installation and equipment that are of direct significance for the exploration and exploitation of natural resources, whether living or non-living, or the construction, operation or use of artificial islands, installations and structures referred to in articles 60 and 80 UNCLOS.

Current legal questions are related to the use of floating objects, vehicles or other devices for marine scientific research on which it is difficult to maintain complete control as they may be carried by currents some distance from their place of deployment, into areas under foreign State's jurisdiction. It might be considered as an internationally wrongful act due to the research consent-regime of the coastal State, including in terms of providing accurate information at least six months in advance (art. 248 UNCLOS).

Further related questions that arise are on State jurisdiction over floating objects. The position in the territorial sea (absolute jurisdiction of the coastal State) and in high seas (absolute jurisdiction of deploying, flag State) is quite clear. The matter is not resolved in the EZZ and CS. The placement of research infrastructure on (or connected to) the seabed is covered by arts. 60 and 80 UNCLOS, which give coastal State exclusive jurisdiction over the construction and use of the installation and structures. For floats and gliders (*i.e.*, pre-programmed autonomous submersible vehicles for data collection), there are no specific rules in Part XIII. It could be understood that coastal States would have jurisdiction in a sense of an overall control over researching States' conduct during marine scientific research. Indeed, they have the duty to comply with certain conditions, including requiring prior agreement for making internationally available the research results of a project of direct significance for the exploration and exploitation of natural resources.

Instruments and equipment deployed at sea for marine scientific research face the urgent need to be protected from accidental damage, vandalism and/or loss.

This is particularly relevant for floating high-tech equipment as well as moored oceanographic instruments in water columns beyond national jurisdiction. Despite the existence of specific international rules, it is easily deducible that the cooperation of all States is essential for appropriate arrangements being put in place for receiving reports, communicating them without delay to all relevant authorities and alerting neighbouring States and ships in the area to incidents or threats of incidents.

Recently in relation to a pilot project of global ocean and climate observation systems, the ARGO Project, promoted mainly by the Intergovernmental Oceanographic Commission of UNESCO (IOC) and the World Meteorological Organization, in which over 30 countries from the various continents and the European Union participate. To date, the ARGO project has deployed over 4000 floating devices as measuring points for temperature and salinity, from the sea surface to a depth of 2000 m.

Despite the scientific enthusiasm, the legal status of these floats and the regulation of their use remains to be clarified. As observed, such devices are, first and foremost, interdisciplinary scientific research equipment, marine and non-marine, including the possible dual-use civil and military; and, secondly, the geographical variable is likely to be modified since the they are free to move, depending on the currents,

from high seas to EEZs of coastal States, which do not participate in the ARGO project and which do not have expressed their authorization to conduct such research activities on climate change in their own EEZs.

Some attempted solutions have been found in practice. With the aim of creating the conditions favorable to the conduct of scientific research, the IOC adopted Resolution XX-6 in which it establishes that the coastal States concerned must be previously informed, through appropriate channels, of all the devices that could go adrift in waters under their jurisdiction, indicating the exact location of the same.

This example shows how, in accordance with UNCLOS regulatory framework, it is possible to boost international cooperation in scientific matters through a competent international organization, to achieve a balance between the exercise of freedom of scientific research and control over that. Otherwise, through the adoption of unilateral acts, it would probably have resulted in diplomatic tensions at the expense of scientific progress.

CONCLUSION. – Law of the sea in respect to legal actions on climate effects on marine environment rests on the tension between the freedom of research of all States and the protection of interests of coastal States. On one hand, freedom is a prerequisite to developing scientific research; on the other hand, scientific research may raise sensitivities associated with economic, social and security interests of coastal States. How to reconcile the freedom of scientific research with the safeguarding of the interests of coastal State is the legal question.

Multilateralism seems to be the best solution, which grants the achievement of balanced interests, while "[s]trengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making [Preamble, Paris Agreement]".

Taking up the slogan of the UN Decade of Ocean Science for Sustainable Development, "the marine science we need for the 'future we want', international law of the sea should be applied in order to ensure an appropriate regulatory framework based on international cooperation on climate research activities at sea.

A paradigm-shift is necessary. Today, UNCLOS Part III implementation is characterized by unilateral acts within a decentralized legal order. But climate change cannot be addressed unilaterally. Therefore,

the shift brought about multilateralism, *i.e.*, scientific cooperation in respect of the sovereignty and jurisdiction of the coastal States of a given sea or ocean, and of the reciprocity of the advantages deriving from the scientific climate results, without precluding the protection, realization and respect of the general interest of humanity.

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