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Zhu Kezhen 竺可桢 (1890-1974) and the Sinicization of Pleistocene Frozen Ground: Preliminary Thoughts on the Geographical Imagination, Historiographical Choices and Ideological Orientations of a Pioneer in Chinese Meteorology

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Scale, time and space will often be discussed in the following pages. Some six decades separate the writing of these lines from the texts they aim at interpreting. A good ten hours' flight over a succession of countries and two continents is needed to reach the geographical point where the author of the works that are the subject of this study lived: the geographer, meteorologist and climate historian Zhu Kezhen 竺可桢. The interplay of differences between these two geo-historical contexts would lead us to compile a list that would be meaningful but not very enlightening for our purpose: from culinary practices to language, from modes of transport to communications, from state institutions to the dominant ideology, from social and family relations to mourning practices and representations, etc. The examples that would enable us to measure the gap in terms of material life, social imagination and the production of subjectivities between Zhu Kezhen's "world" and that of the author of these lines are endless. We could play the game the other way round, and consider a succession of practices, objects, technologies, institutions or even notions common to these two societies as part of a shared global modernity, with variations in terms of uses and interpretations: basketball, the thermometer, cinema, electricity, industrial production, university conferences, science, the republic, equality, progress, marxism, etc. The inventory would be limitless.
The rigorous historian cannot play the game of comparisons so lightly. However, calculating the distance between one's "point of anchorage" and one's "object of study" is a salutary exercise in order to underline one's own historicity and prevent overhanging positions (Jablonka, 2017). Let's be more precise, and read what Zhu Kezhen had to say in January 1962 about climate change in history:

> In an article in the People's Daily dated January 26, 1961, Tu Changwang (涂长望), Head of the Central Bureau of Meteorology, had already summed up the problem of global warming in the 20th century. This problem, which has led to heated discussions in Euro-American journals, is affecting agriculture, forestry, livestock farming, fishing, transport and the economy in a number of regions around the world. Global warming is even more evident in high-latitude regions. (Zhu, 1962)

Zhu Kezhen's historical narration is here caught up in the universal and linear calendar time that the colonial West has imposed on the rest of the world since the 18th century (Mignolo, 1995; Villard, 2022). In addition to the precise dating of Gregorian calendar days, his work uses the chronological conventions of modern “regime of historicity” (Hartog, 2003) to order climate variations on different scales, from "historical time" (*lishi shidai* 历史时代) to "geological time" (*dizhi shidai* 地质时代). In the article quoted above, the narrative is structured around a common space - the "world” (*shijie* 世界) - which confirms that Zhu Kezhen’s spatial imagination goes far beyond the nation to encompass the global dimension that is part of the Chinese discourse of modernity (Tang Xiaobing, 1996, Karl, 2000). Although this expression of “global warming” (*qihou biannuan* 气候变暖) instantly establishes Zhu Kezhen in "our" contemporary imagination, it referred for him only to the most recent segment of a very long climatic history, without possessing the cataclysmic dimension that would later adorn it. While in his view, this phenomenon is still a natural history, he does not fail to underline the effects of these variations on the trajectory of human history: "this problem", he writes, "impacts agriculture, forestry, livestock farming, fishing, transport and the economy in a number of regions of the world". A few paragraphs further on, he anticipates the consequences of melting glaciers and rising sea levels, again from a "worldwide" perspective:

> If all intra-continental glaciers, and even those in the Antarctic, were to melt, it is estimated that sea levels would rise by around

> 80-90cm, submerging metropolises such as Beijing, Shanghai, London, New York and Leningrad. (Zhu, 1962)

This excerpt confirms that "environmental reflexivity", and in particular climatic reflexivity, on a "planetary" scale, is not a Western contemporary cognitive privilege, as underlined by the recent work of historians and sociologists, foremost among them Fressoz and Bonneuil, who developed these highly stimulating analytical categories (Fressoz/Locher, 2012; Bonneuil, 2020). If this anticipation of climate catastrophe resonates powerfully with our contemporary imaginations, anxiously tending towards that horizon, it is, on the contrary, purely unrealistic speculation in the mind of Zhu Kezhen, who is quick to reassure his readers:

> However, there's no need to worry too much about the sky falling down (杞人忧天). Climate evolves by spinning around (螺旋式的盘旋) through successive fluctuations. This is as true in geological time as it is in historical time. (Zhu, 1962)

It is on this precise point that our “episteme” differs from Zhu Kezhen’s one: "Climate evolves by spinning around through successive fluctuations ". It is this assertion, confirmed by many other examples, that gives Zhu Kezhen his historicity. The privilege of the present authorizes us to say that Zhu Kezhen is living under the "new climatic regime" (Latour, 2015) without knowing it, and that he is already part of the new geological period that Paul Crutzen called the "Anthropocene" at the dawn of the 21st century (Crutzen, 2002).

In 1962, Zhu Kezhen believed that this factual observation of "global warming" is due to the internal variability of the climate. He considered that the global warming that had begun at the end of the 19th century was a natural fluctuation of the temperature curve. He reflected here the relative consensus of the international scientific community of his time which he actively belonged to (Sun Mingming, Jiang Shaoyuan, 2018 ; Barrett, 2022). He was aware but not convinced by the theory of the anthropogenic global warming already circulating among some American scholars (Maslin, 2021 ; Fressoz/Locher, 2020).

Writing a history of climate fluctuations might appear to be a neutral, factual scientific exercise. The time-temperature curves that decorate his articles are an independent narrative, separate, watertight, from a history of human societies, showing the internal climate variability. No geological or climatic human agency is present in his analysis of climate

fluctuations during what he calls "historical times". The object of this history - the state of the atmosphere - is subject to a double otherness: like any historical object, it belongs to another time, and like any part of so-called natural history, it belongs to a field of reality external to humans.

However, it would be risky, and questionable, to consider Zhu Kezhen's work as part of a history that would be "free of anthropocentric concerns", to use the expression of Le Roy Ladurie, another precursor in the field of climate history (Le Roy Ladurie, 1967). On the contrary, social, political and ideological issues are constantly running through his writings on meteorites, temperatures, glaciers, floods and droughts. His scientific and institutional commitments are entirely guided by the desire to support the construction of a powerful, sovereign and modern Chinese nation (Wang Zuoye, 2002). But beyond the "scientific nationalism" that permeated the entire scientific and intellectual field of his time, he was interested from his earliest works in the effects of the atmosphere's vicissitudes on human societies: meteorological anomalies, long-term fluctuations, environmental determinism (during the Republican period) and weather forecasts. Zhu is also a historian of meteorological knowledge - pre-modern Chinese society's perception and understanding of atmospheric phenomena - and of the political consequences of the West's epistemological hegemony over this knowledge in China from the 16th century onwards (Zhu, 1917, 1951, 1955). Last but not least, his work as a climate historian is part of a social, cultural and political history, for reasons that are not only methodological but also ideological. His most accomplished research focuses on the climate in China during the period known as the "historical times", basing his hypotheses on traces and above all documents - mainly texts - produced by the "Chinese" society during the last “5,000 years” (Zhu, 1973). He considers that the advantage of climatic history knowledge in China lies in this abundance of "human" sources over the long time span of this supposedly multi-millennial history (Zhu, 1924, 1933, 1962, 1973). It's a history of climate through the symbolic, literary and aesthetic representations produced by human activities: writing, poetry, romance literature, official histories, and local gazettes. This preoccupation with perceptions and representations rooted in society was further reinforced in the 1960s – and especially during the Cultural Revolution - by anti-intellectualist tendencies and the Maoist glorification of “the culture of mass science” (Fan Fa-Ti, 2017). His late research in the field of phenology (*wuhouxue* 物候学) was guided by this idea of writing a grassroots history of climate partially based on peasants’ knowledge (Zhu, 1973).

This study attempts at elucidating the geographical imagination, historiographical choices and ideological orientations of a pioneer in Chinese Meteorology in the early 1960s, to shed light on the representations of time, space, "the world" and "China" that unfold in Zhu Kezhen's climatic knowledge, and to interpret - beyond scientific rationality and technical language - the categories of this "instituted imaginary" (Castoriadis, 1975) specific to an individual subject and a society taken collectively, without necessarily being able to disentangle what belongs to one or the other.

A whole range of intertextualities, discourses, historical experiences, ideological burdens and knowledge belonging to both immediate history and longer timeframes, to a "Chinese" context and to global circulation, all contribute to the constitution of this "instituted imaginary". Aware of the fact that meteorology and climate history are fields that mobilize multiple temporal and spatial scales, this research is set to reflect on how different spatio-temporal scales are articulated in the scientific writings of Zhu Kezhen. The following quotation provides an illuminating introduction to the issues at stake in this research project:

> In the past, the question of whether China (中国) could have been covered by glaciers during the Quaternary era was not clear-cut. Geographical investigations and geological explorations carried out since the founding of PRC have demonstrated that in many regions, such as the Huabei, Dongbei, Huadong and also the Tian Shan massif and the Qilian Mountains, there were at least three glacial and inter-glacial periods. During the Ice Ages, the climate was much colder than today, probably 8° colder in summer and 12° colder in winter than in France or Germany. During the inter-glacial periods, the climate was probably comparable to or even milder than that of the present era. (Zhu, 1962)

No geographical or civilizational indexation accompanies this abstract and universal time scale. Here, the deep time of geological periods overhangs the Eurocentric and colonial philosophies of history of modernity to impose a unique "world" narrative and a common contemporaneity (the “present era”). In this temporality, which echoes a regime of historicity we might call "planetary" (Chakrabarty, 2021 ; Bonneuil, 2020), the dominant historiographical issues of Chinese modernity - nationalism and anti-imperialism - seem to

disappear from the grand narrative. However, by asking whether "China" could have been covered by glaciers in the "deep time" of a geological history, Zhu Kezhen inscribes in his scientific language a cardinal notion of his contemporary social and political imaginary. The case for anachronism might seem implausible if we consider that "China" is a purely conventional category. But can we limit its meaning, and above all our interpretation, to this cold, neutral reading? The semantic and historical depth of the signifier "China/*Zhongguo*" inevitably goes beyond a definition limited to geographical coordinates (Lee, 2018 ; Dirlik, 2019). The list of "regions" mentioned in this extract draws a territory that merges with the nation's "geobody" as envisaged by Zhu Kezhen and his contemporaries in 1960 (Winichakul, 1994). This "geobody", in the sense of a cultural, symbolic and political cartographic construct, was invented and then instituted by the nation's thinkers and activists in the twilight of the Qing dynasty at the end of the 19th century (Callahan, 2009).

Zhu is located within this modern ideological tradition through the performative magic of his narrative, which nationalizes the icy soils of the Pleistocene. Without any explicit political intention, he repeats the gesture of the first Chinese nationalists who, from Liang Qichao to Zhang Binglin, set out to invent the Chinese nation by carrying out discursive and institutional work aimed at naming and then "sinicizing" the various elements that would make up this nation: individuals, a people, a language, a culture, an ethnicity, a literature, an aesthetic and, of course, as part of this heterogeneous reality, a past and a geography (Dirlik, 2019).

Uncertain, contradictory, sometimes arbitrary and often dependent on political circumstances, the criteria used to legitimize and rationalize the various aspects of Chinese national identity were supported by the development of scientific disciplines in the twentieth century, meteorology and geography being no exception (Zarrow, 2011; Tzeki Hou, 2011 ; Yen Shen Grace, 2014). However, the laws of fluid mechanics produce phenomena that recognize neither state borders nor national identities.

And yet, Zhu Kezhen's meteorological knowledge is constantly permeated by a spatio-temporal imaginary, cultural references and national ideological stakes. From his early work, marked by a powerful environmental and climatic determinism, to his later studies on a history of climate based on phenological sources and his highly sino-centric historiography of meteorological knowledge, Zhu Kezhen never ceases to bring the fluctuations of the global atmosphere down to a "Chinese" land.

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