

Nice weather, meteors at the end of the day

Christina Helena Barboza
Museum of Astronomy and related Sciences – RJ/Brazil
christinabarboza@uol.com.br

1. Introduction

The main objective of this paper is to explore the complexity of the links traditionally established between the origins of modern meteorology, in the middle of the nineteenth century, and the simultaneous creation of the first national weather forecasting services. It is based on my Ph.D. thesis.¹ In the thesis, however, which is partially a scientific biography, I was more interested in examining the meteorological writings of a specific scientist, the French Emmanuel Liais (1826-1900). Here, I would like to stress the role of Liais in the history of meteorology, focusing the analysis on his contribution towards the creation of the French weather forecasting service, at the Paris Observatory, in 1856.

This paper supports the hypothesis that the creation of the French institution was due to a brief conjunction of two men's efforts, Emmanuel Liais and Urbain Le Verrier, who contributed, respectively, to its scientific and political foundations. Therefore, with this particular example, it also aims at reinforcing the general theoretical assumption, shared by the participants of this Conference, that in the History of Science it is always necessary to examine both the scientific developments and the social contexts where they take place.

2. Liais and the Paris Observatory's telegraphic meteorological network

Emmanuel Liais was born in Cherbourg, a port in Normandy, where his family was wealthy and politically influential. Before moving to Paris and going to work in the Observatory he had already written many papers on different scientific areas, especially on meteorology, but in fact he was not entirely convinced that he could be a professional scientist. In other words, he was still an amateur – “ami de la science”, as such people were referred to in France.

Liais' early papers on meteorology focused on different subjects, many of which could be classified as belonging to a “meteoric tradition”, according to Jankovic's definition.² They were descriptions of falling stars, halos, and the damage resulting from lightening and hail. He regularly sent those papers to the Paris Academy of Sciences without calling the desired attention of its members. In 1852, however, a paper concerning his research about Cherbourg's climate led to a different reaction. The research lasted four years, during which Liais took regular temperature and pressure measurements, among other local meteorological data, in order to support the idea that the climate in his homeland was milder than in Paris. As one of the Academy secretaries, the astronomer François Arago was in charge of selecting and presenting the papers of non-members. Impressed with Liais' work, especially the care with which this unknown amateur took his measurements, Arago praised it before the fellows of the Academy.³

¹ BARBOZA, Christina Helena. *Nice weather, meteors at the end of the day; a history of meteorology in the middle of the nineteenth century through the writings of Emmanuel Liais*. PhD Thesis, University of São Paulo, 2002.

² JANKOVIC, Vladimir. *Meteors under scrutiny: private, public, and professional weather in Britain, 1660-1800*. PhD Thesis, University of Notre Dame, 1998.

³ *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*. Paris: Bachelier, Imprimeur-Libraire, 1852. T. 35, p. 349.

Liais was called to join the Paris Observatory as a trainee in the beginning of 1854. At that time the Observatory's director was the mathematician and astronomer Urbain Le Verrier (1811-1877), an Academy fellow, who probably had noticed him through Arago's praises. In fact, the Observatory's director until the end of the previous year had been Arago, and Le Verrier himself started to work there only one month before Liais. The circumstances were then very favorable to Le Verrier. He had accumulated a considerable amount of "scientific capital" with his discovery of Neptune, in 1846, and pushing forward the economic metaphor proposed by Pierre Bourdieu, we could say that he also had the political capital obtained after his nomination to the Senate by Louis-Napoléon, the Emperor of France, in 1852.

In fact, Le Verrier took over his functions with an ambitious project of reorganizing the centenary institution and erasing the legacy of Arago, a republican who had refused to swear a loyalty oath to the new regime. The main purpose of this project was to extend political control to the scientific activities traditionally developed in the Observatory. In meteorology, for instance, the institution was responsible for the collection of local temperature and pressure regular measurements, and their diffusion by means of a scientific journal, the Academy's *Comptes rendus*. After the intended reorganization, it would become the center of a government-controlled meteorological network spread throughout the national territory and linked by telegraph.⁴

The improvement of telegraph's technology in the early 1850's had strengthened the seventeenth century idea of establishing meteorological networks. In France, the Meteorological Society, founded in 1852, with Liais among its founding members, was an attempt to create such an institutional structure with the collaboration of provincial meteorological observers, both professionals and voluntaries, promoting the exchange of their data. Nevertheless, the Observatory's project ignored this initiative, with the argument that the observations had to be absolutely standardized, and proposed instead the transformation of the employees located in the governmental telegraphic stations into meteorological observers. The practical purpose of each institution also differed. While the Meteorological Society aimed at constructing a map of France's climate useful in agriculture and public health, two traditional areas of meteorological knowledge application, the Observatory's meteorological network aimed at providing storm warnings to the French seaports.⁵

Some isolated experiments of constructing daily weather maps using the telegraph and eventually predicting the weather had already been made in the early 1850's, in England and in the United States, as the historiography has pointed out.⁶ Besides, it is unquestionable that Robert FitzRoy, the first director of the British Meteorological Office, created at the end of 1854, had the hope of providing storm warnings for the coasts with the aid of the standardized observations made in a network of mercantile and military ships. But none of these initiatives had reached the same amplitude of the telegraphic meteorological network set up by the Paris Observatory in 1856. Firstly, the simple idea of transforming the governmental telegraphic stations into meteorological stations enabled the system to start functioning a few months after the necessary academic approval of the reorganizing project.

⁴ The meteorological section of Le Verrier's reorganizing project was published and can be found in: *Annales de l'Observatoire Impérial de Paris, publiées par U.-J. Le Verrier*. Paris: Mallet-Bachelier, 1855. T. 1, pp. 51-68.

⁵ The foundation proposals of the French Meteorological Society can be found in the first number of its journal: *Annuaire de la Société Météorologique de France*. Paris, Imprimerie de Beau Jeune, 1853. T. 1.

⁶ For an exhaustive chronology of those early experiments and the creation of the first nineteenth century meteorological observational "systems" in Europe and in the United States see: FLEMING, James R. *Meteorology in America, 1800-1870*. Baltimore, London: The Johns Hopkins University Press, 1990. An historical account specifically of the British Meteorological Office origins was given by Jim Burton in: BURTON, Jim. Robert FitzRoy and the early history of the Meteorological Office. *British Journal for the History of Science*. v. 19, 1986, pp. 147-76.

Secondly, the French meteorological network covered the whole national territory, and soon began to expand itself towards the continental neighbors.

Liais helped Le Verrier implement the French meteorological network, adapting the thermometers and the barometers for the unskilled telegraph operators. Later on, he argued that he also helped Le Verrier both to conceive and write the meteorological section of the Paris Observatory reorganizing project. But Liais' most significant contribution towards the creation of the Paris Observatory's meteorological network was the development of scientific research about a particular storm. The so-called Black Sea storm occurred on the 14th November 1854, and caused the sinking of British and French ships anchored off the Crimea Peninsula, during the war.

In the paper resulting from this research, developed with the information received by telegraph and by mail from different parts of Europe, Liais proposed the construction of two kinds of pressure lines on the continental map. The first ones, called "atmospheric waves", were based on Adolphe Quetelet's scientific work, as Liais himself recognized some years later. In Liais' paper, these "atmospheric waves" were the graphic representation of a real displacement undergone by the air masses, at the top of the atmosphere, which produced "irregular oscillations" on the barometer readings. The second group of pressure lines was his own original contribution to meteorological theory. He called them "lines of transport of the waves". Basically, they represented the paths of the absolute values of the pressure highs and of the pressure lows of one single "atmospheric wave". And though Liais didn't have enough data to draw these lines all the way from the Atlantic coast of Europe until the Black Sea, he suggested that they could have predicted the displacement tendency of the storm in this precise direction better than the "atmospheric waves".⁷

The basic assumption that storms "travel" through the European territory in a general west-east direction, fundamental to the constitution of modern meteorology, was then present in Liais' study. Still, Liais was very emphatic in his paper when he stated that one could not simply assume that a specific depression would continue its observed motion without unexpected shifts. Moreover, he denied the thesis that between the existence of depressions and the occurrence of storms there was an unconditional cause-effect link. In other words, although already applying the tools of dynamics to meteorology, Liais conceived meteorological phenomena in a traditional local manner.

Le Verrier presented Liais' paper in the Paris Academy of Sciences on the 31st December 1855. As he was not a member, Liais himself wasn't allowed to present his own paper personally. But Le Verrier was more interested in the academic approval of his reorganizing project. In consequence, he ignored the conjectures raised by Liais with the argument that the immediate establishment of a telegraphic meteorological network with a storm warning service could even benefit the research underlying the understanding of storms, due to the input of a large amount of data.

The scientific curiosity caused by Liais' paper was fundamental for the Academy's approval of the creation of the Paris Observatory telegraphic meteorological network, especially if we consider some historical factors. The Paris Observatory was a centenary institution, and although activities in different scientific areas were developed there, it was strongly identified with astronomy. Besides, the nineteenth century trend in sciences pointed towards specialization. In the 1850's there was no consensus among scientists concerning the existence of any law governing meteorological phenomena, which according to supporters of the "meteoric tradition" were intrinsically unpredictable. Finally, we can mention the

⁷ *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*. Paris: Mallet-Bachelier, Imprimeur Libraire, 1855. T. 41, pp. 1197-1204.

Academy's general animosity against the Emperor as another significant factor in the rejection of Le Verrier's project.

The French telegraphic meteorological network began to function in 1856. Nevertheless, the first French storm warnings wouldn't be provided to the threatened locations until 1863, two years after the English forecasts. One possible reason for this delay was the growing disagreement between Liais and Le Verrier about the service. Liais openly wished to be admitted to the Paris Academy of Sciences, but according to his own complaints, there was no time available for research since the network began to function. Actually, there was no time even to construct the intended daily weather maps. While he worked there, the service was limited to the diffusion of tables containing meteorological data from the French stations by means of an evening newspaper. In the beginning of 1858, when the service acquired its own publication means, Liais left the Paris Observatory, and took a ship to Brazil, with the excuse of observing a solar eclipse.⁸

3. Conclusion

Emmanuel Liais lived in Brazil for seventeen years. During this stay, he became a close friend of the Brazilian Emperor, who ironically invited him to take over the direction of the national Observatory, located in Rio de Janeiro, with the task of reorganizing it. Liais was the Observatory's director between 1871 and 1881, and the successful achievement of his task made him better known in the Brazilian historiography of sciences than in the French one.

In the middle of the nineteenth century, Brazil was a recently independent National State, still trying to compensate for the absence of infrastructure, a condition inherited from the colonial period. In other words, there was nothing similar to a telegraphic network in this country until the end of the 1880's. Anyway, there is no evidence that Liais was interested in promoting the development of dynamical meteorology in the Brazilian Observatory. As a matter of fact, it seems that after the Paris years, he abandoned this path and turned back to the descriptions of unpredictable "meteors".

A few authors have already examined the history of the Paris Observatory's telegraphic meteorological network and its weather forecasting service. I would like to mention especially my debt to John Davis' research.⁹ But none of those authors have understood the role accomplished by Liais in the creation of the French institution, which, in general, was attributed to Le Verrier's foresight and initiative. This is not an issue exclusively about scientific priorities, although priority issues are important ones in scientific activity. My intention here, bringing Liais' contribution to light, is above all to support the idea that the decisive steps in any scientific development are produced by an ephemeral convergence of different and often contradictory historical forces.

⁸ Liais left us his own historical account of the Paris Observatory's telegraphic meteorological network creation in: LIAIS, Emmanuel. *L'Espace Céleste, ou Description de l'Univers, suivi de récits de voyages entrepris pour en compléter l'étude*. Paris: Garnier Frères, Libraires-Éditeurs, 1881, pp. 396-400.

⁹ DAVIS, John L. Weather forecasting and the development of meteorological theory at the Paris Observatory, 1853-1878. *Annals of Science*. v. 41, n. 4, Jul 1984, pp. 359-82. Surprisingly, the contemporary French historiography of science has not paid enough attention to the creation of such important institution. Therefore, we can find more information on this subject in a paper written during the 1940's, in a traditional approach: DANJON, André. Le Verrier créateur de la météorologie. *La Météorologie*. Out-Dez 1946, pp. 363-82.