

**PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH
DISTINGUISHES THEM FROM ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the
PERIOD With 1929 Till 1988.**

Nataliya Anatolievna Solodovnik

(Natalija Solodovnika)

Riga, Latvia, e-mail: nyos@nyos.lv

The Influence of the diverse natural factors (the atmospheric precipitation, landslips, landslides, earthquakes, lava streams and others) to triggering of the process of the limnological catastrophes(in 1984r. on the lake "MONOUN" and, in 1986r., on the lake "NYOS") is subject of the discussion in the articles (1-8).

The landslips, landslides, earthquakes, lava streams - an events rare, which can be considered by the casual phenomenas.

The limnological catastrophes on the lake "NYOS" and on the lake "MONOUN" are also events rare.

If limnological catastrophe is caused by rare casual process, consequently, limnolical catastrophe is also event casual.

However, there is not reliable acknowledgements about it, that limnological catastrophe is caused by rare casual process - a landslips, landslides, earthquakes, lava streams and others.

Unlike mentioned casual processes, atmospheric precipitation in vicinities the lake "NYOS" and the lake "MONOUN", event natural, predictable, which are described by unceasing rotating during time of the increase and reduction of the mass falling to the ground waters.

Consequently, by the basic feature of the atmospheric precipitation is the periodicity at time.

There is the systems, which are responding at periodical processes only to definite sign, one of the values, by which is characterizing such process.

The resonance system can be by the Example of this.

It is, reasonably, give estimation of possibility of existence of the such distinguishing particularities of the atmospheric precipitation in vicinities of the lakes "NYOS" and "MONOUN" Cameroon, for which may be possible the respond of the systems capable to trigger the limnological of the catastrophe.

Presence such distinguishing particularity of the atmospheric precipitation, have allowed to consider the distinguishing particularity, as necessary (but not sufficient) event, which could be a probable reason, triggering limnological catastrophes.

Below, author describes manner revealing of particularity of the atmospheric precipitation, which was falling out in vicinities lakes "NYOS" and "MONOUN" in CAMEROON, at period (9) with 1906 till 1988.

The Sequence of the annual atmospheric precipitation (1) in vicinities the lakes "NYOS" and "MONOUN" in CAMEROON, shown on **Fig.1.**, has maximum importances 344,8cm. (for 1923), 308,5cm. (for 1957) and minimum 179,51cm. (for 1987).

Accordingly, of the available (for author of this article) information, by visually, was not possible do of the selection of the distinguishing particularities from sequences of the annual atmospheric precipitation, shown on **Fig.1.**, such, on which could be responded by systems, capable to trigger the limnological catastrophe.

Analogously, was not possible do of the selection of the distinguishing particularities from sequences of the the monthly atmospheric precipitation in vicinities of lakes "NYOS" and "MONOUN" in CAMEROON with 1906 till 1988 (station BAMENDA, coordinates: 6.0N, 10,1E, 1608m), such, on which could be responded by systems, capable to trigger the limnological catastrophe.

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik

(Natalija Solodovnika)

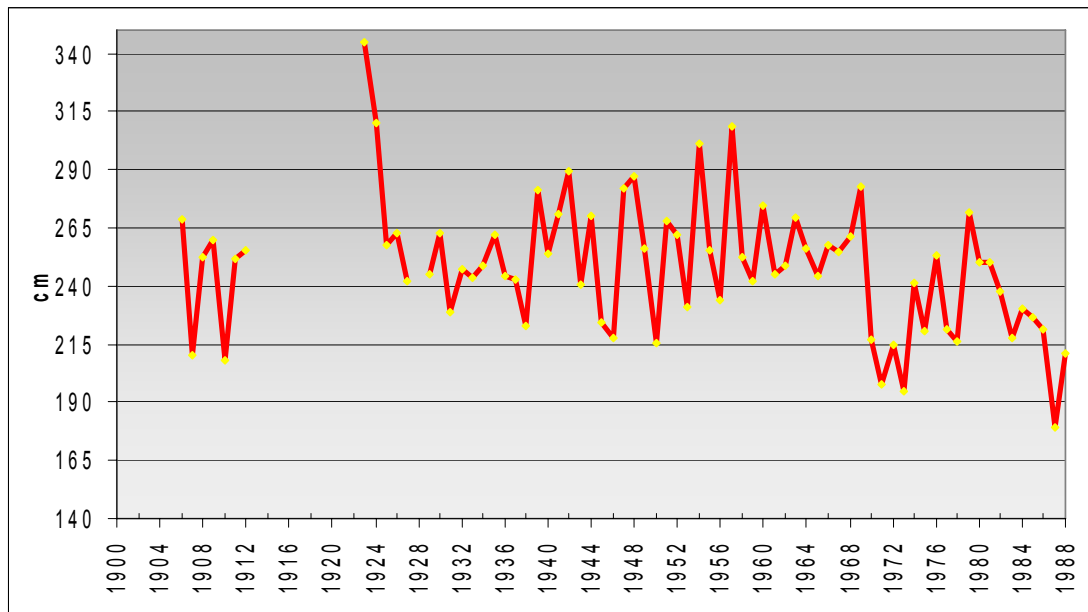


Fig.1. The Sequence of the annual atmospheric precipitation in vicinities of lakes "NYOS" and "MONOUN".

There is the various physical effects, caused by fallout of the atmospheric precipitation. Each of this effects possibly to use as measure of the atmospheric precipitation.

It is interesting physical effects, which can promote increasing of the mole-fraction of the carbon dioxide in water solution, who will being entered in the sediment stratum under lake's bottom.

According to description and scheme, provided in article (1), physical effects, who reduce velocity of stream of water (the water solution) in the pressure confined aquifer, such effects promote increase of the mole-fraction of the carbon dioxide in water solution.

According to of mentioned description and scheme (1), necessary condition of the reduction to velocities of the current of water (the water solution) in the pressure confined aquifer is a reduction of amount of atmospheric precipitation, falling out in the field of feeding (entry) of the pressure confined aquifer.

The Reduction of amount of atmospheric precipitation, falling out in the field of feeding (entry) of the pressure confined aquifer, causes the reduction of a level of water in the field of feeding (entry) the pressure confined aquifer.

The Reduction of the level of water in the field of feeding (entry) the pressure confined aquifer causes the reduction to velocities of the current of water (the water solution) in the pressure confined aquifer.

According to description and scheme (1), velocity of the arrival of carbon dioxide (from terrestrial depths) in the pressure confined aquifer remains the constant at reduction of the velocities of the current of water (the water solution) in the pressure confined aquifer.

Therefore, in the pressure confined aquifer, at reduction of the velocities of the current of water, occurs increases of the mole-fraction of the carbon dioxide in water solution, which are forming at dissolution in this water of carbon dioxide entered from terrestrial depths.

Hereinafter, a part of water solution of the carbon dioxide will move from the pressure confined aquifer upwards in the sediment stratum under lake's bottom.

The Pressure in liquid (the water solution of the carbon dioxide) when moving water solution of the carbon dioxide upwards from the pressure confined aquifer in the sediment stratum is greatly will lower.

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

**Nataliya Anatolievna Solodovnik
(Natalija Solodovnika)**

Reduction of the pressure in liquid (the water solution of the carbon dioxide) causes the discharge from liquid (the water solution of the carbon dioxide) of the carbon dioxide (the gas).

The Solid porous phase (the skeleton) the sediment stratum doesn't allow of increase of the volume, standing out from solution, gaseous of the carbon dioxide (the gas).

The Increasing of the mass of the gaseous carbon dioxide (the gas) under unchangeable volume of the gas, accompanies by the growing of the pressure of the gas, by the appearance and growing of tensile stress in the Solid porous phase (the skeleton).

The Growing of tensile stress in the Solid porous phase (the skeleton) brings about her destruction and instantaneous increase of the volume of gaseous carbon dioxide (the gas).

Is Simplest, reveal for us, differences of atmospheric precipitation, by use of average importance of monthly atmospheric precipitation for January with 1906 till 1988, for February with 1906 till 1988, etc. till December of each year of the period with 1906 till 1988, **Fig.2.**

Furthermore, to us, would be necessary the average monthly importance of all atmospheric precipitation (registered) of period with 1906 till 1988, **Fig.2.**

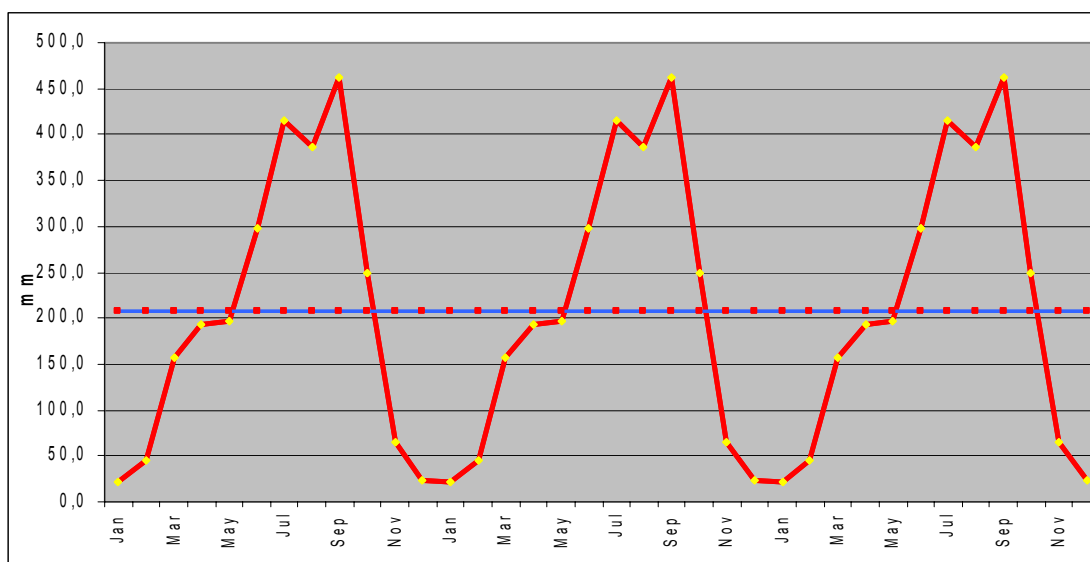


Fig.2. The Sequence of the average monthly atmospheric precipitation in the vicinity of lakes "NYOS" and "MONOUN":

the curve of the red colour - an average monthly importance of the atmospheric precipitation (for month specified on horizontal axis), including only periods of the registrations with 1906 till 1988;

the straight line of the blue colour - an average monthly importance of the atmospheric precipitation during period with 1906 till 1988 (including only periods of the registrations).

Taking into the consideration **Fig.2.**, possible, select of two characteristic lengths of time, referring towards fallout of the atmospheric precipitation:

1. the period with June till October, in which the average monthly importance of atmospheric precipitation (for corresponding month) exceeds the average (207,3 mm/month) importance of the atmospheric precipitation, falling out for month;
2. the period with November till May, in which the average monthly importance of atmospheric precipitation (for corresponding month) smaller of the average (207,3 mm/month) importance of the atmospheric precipitation, falling out for month.

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik

(Natalija Solodovnika)

Taking into the consideration, the abovementioned the necessary condition of reduction to velocities of the current of water in the pressure confined aquifer, reasonably, has do of the estimation of distribution of total amount of the atmospheric precipitation, falling out with November till May (for corresponding year), (**Fig.3.**), in the vicinity of lakes "NYOS" and "MONOUN" in CAMEROON (station BAMEDA, coordinates: 6.0N, 10,1E, 1608m), at period with 1906 till 1988.

On (**Fig.3.**) is distinctly seen, that minimum of the value (303,3 mm.) total amount of the atmospheric precipitation, falling out since November till May, characterizes 1983.

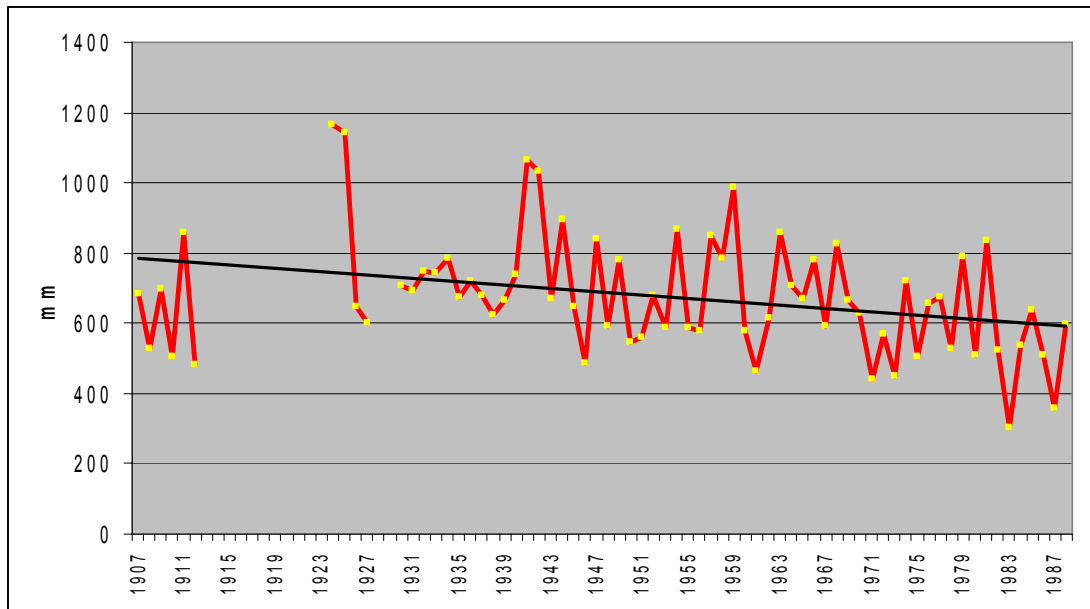


Fig.3. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of lakes "NYOS" and "MONOUN" with November till May month during period with 1907 till 1988 (the red curve). The Line of regression (the black straight line).

Said, has complement **Fig.4.**, **Fig.5.**, **Fig.6.**, **Fig.7.**, and **Fig.8.**, on which is shown the sequence of the sums of average monthly atmospheric precipitation with November till May in the vicinity of five stations "DSCHANG" (station DSCHANG, coordinates: 5,3N, 10E, 1407m), "YOKO" (station YOKO, coordinates: 5,6N, 12,4E, 1027m), "NGAMBE" (station NGAMBE, coordinates:4,3N, 10,6E, 610m), "NKONGSAMBA" (station NKONGSAMBA, coordinates:5,0N, 9,9E, 816m), "Banyo" (station BANYO, coordinates: 6,8N, 11,8E, 1110m).

On all five drawings (**Fig.4.**, **Fig.5.**, **Fig.6.**, **Fig.7.**, **Fig.8.**) is distinctly seen, that minimum of the value total amount of the atmospheric precipitation, falling out since November till May on five stations, characterizes 1983.

Consequently, the distinguishing particularity 1983r., it is the value (characteristic 1983) that total amount of the atmospheric precipitation, falling out with November (1982) till May (1983) in vicinities of lakes "NYOS" and "MONOUN" and of five other stations, and who smaller in contrast with such value, characterizing any other year at period with 1907r. till 1988r..

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik
(Natalija Solodovnika)

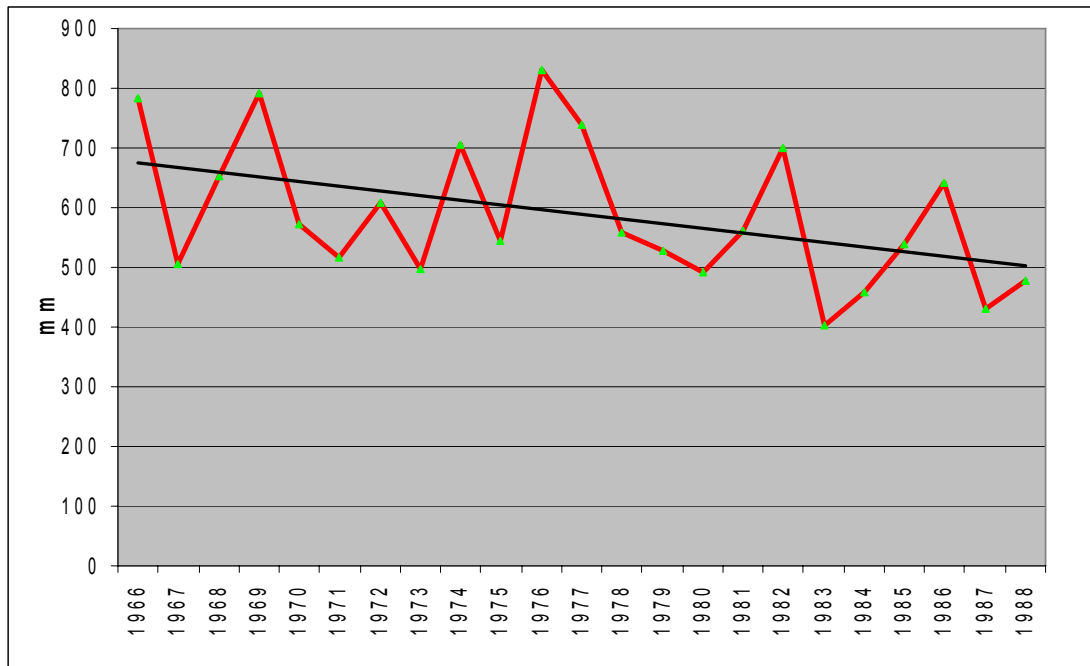


Fig.4. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of station «DSCHANG» with November till May month during period with 1966 till 1988 (the red curve). The Line of regression (the black straight line).

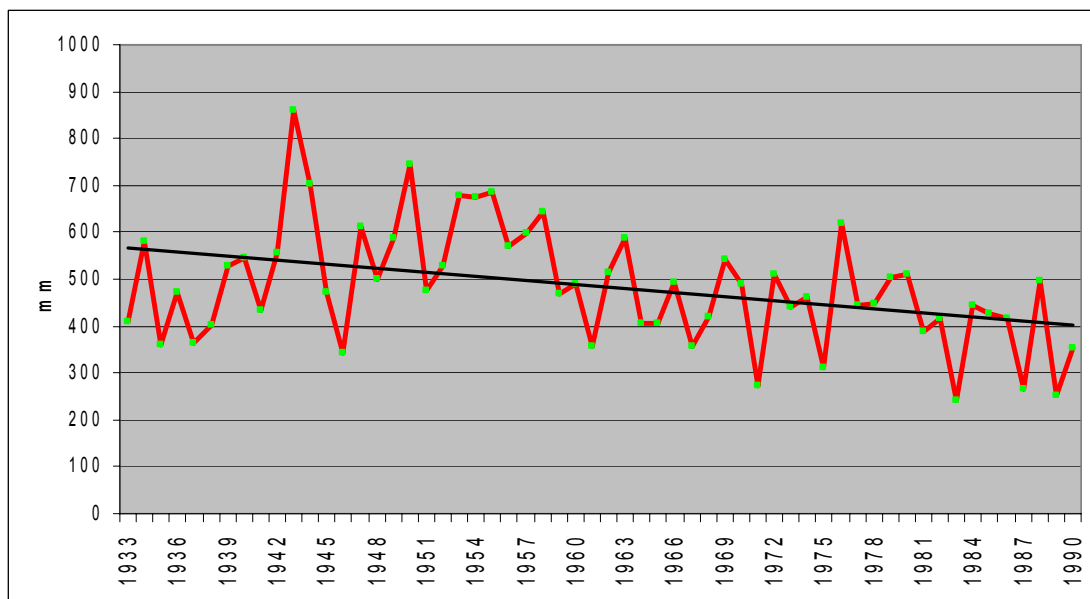


Fig.5. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of station «YOKO» with November till May month during period with 1933 till 1990 (the red curve). The Line of regression (the black straight line).

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik

(Natalija Solodovnika)

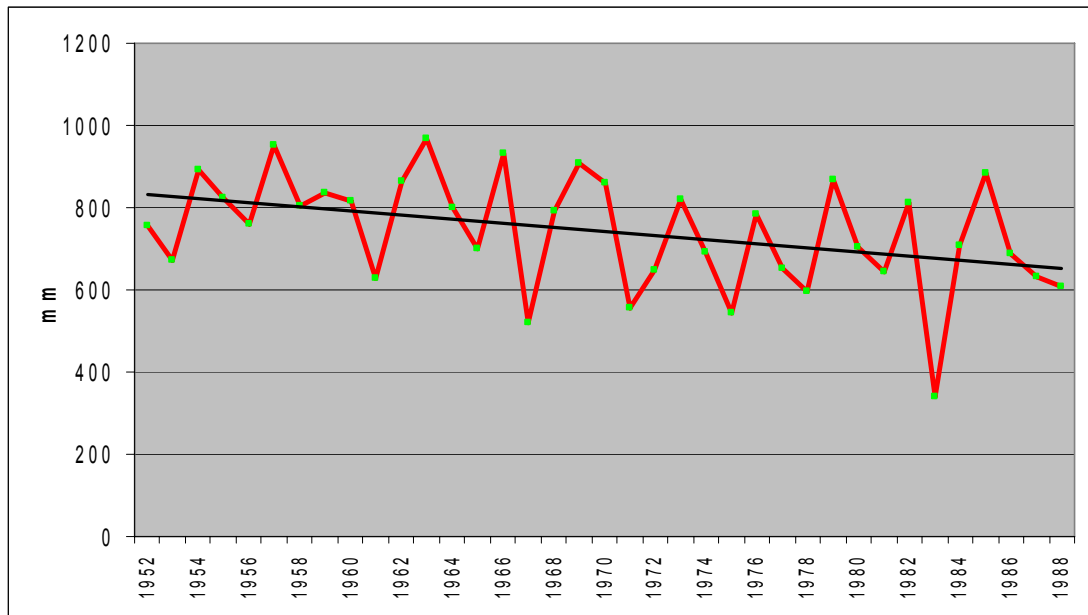


Fig.6. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of station «NGAMBE» with November till May month during period with 1952 till 1988 (the red curve). The Line of regression (the black straight line).

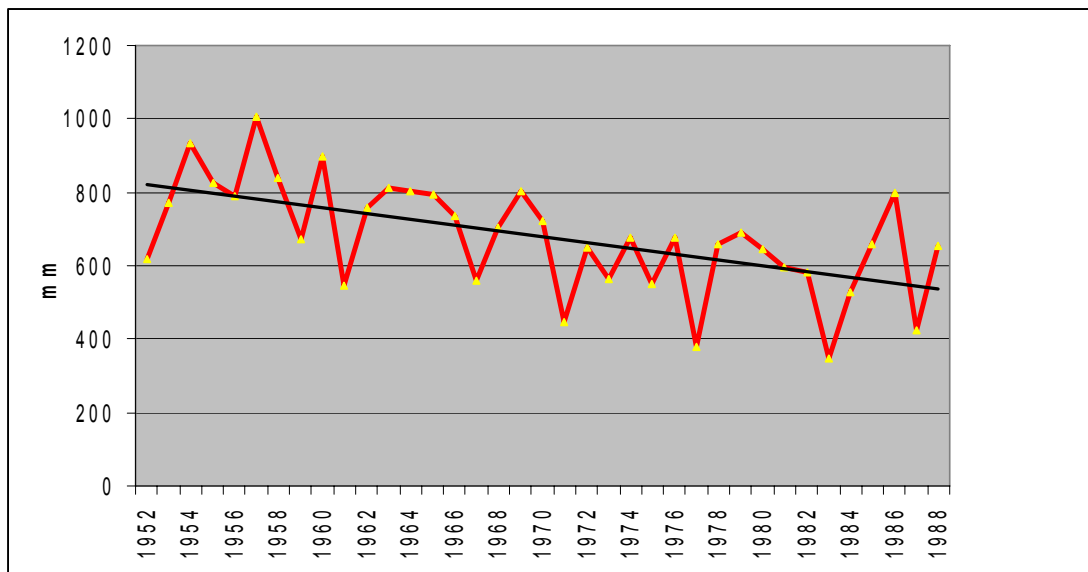


Fig.7. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of station «NKONGSAMBA» with November till May month during period with 1952 till 1988 (the red curve). The Line of regression (the black straight line).

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik

(Natalija Solodovnika)

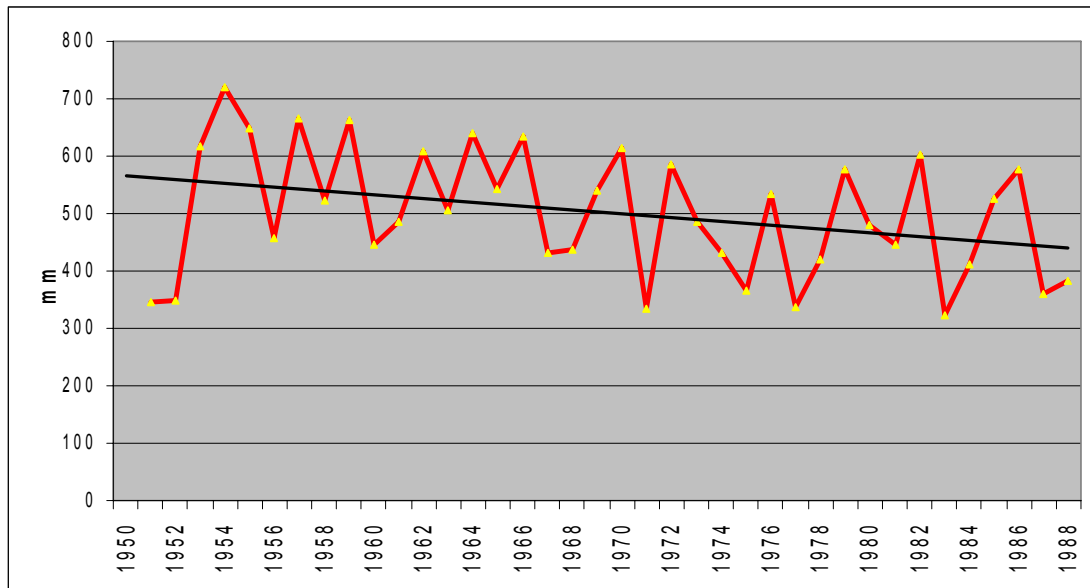


Fig.8. The Sequence of the sums (for year specified on horizontal axis) of average monthly atmospheric precipitation in the vicinity of station «BANYO» with November till May month during period with 1952 till 1988 (the red curve). The Line of regression (the black straight line).

The Minimum of the value (303,3 mm.) of total amount of atmospheric precipitation, falling out with November 1982 till May 1983 in vicinities of lakes "NYOS" and "MONOUN" may turn out to be by such importance of the atmospheric precipitation, the respond on which(who) can be from such systems, which can cause the limnological catastrophe.

Of Such system, of according to said , may be the pressure confined aquifer under bottom lake , which are characterized interdependents by the level of water at the input in aquifer , by the velocity of the current of water (the water solution) in the aquifer and by the mole-fraction of the carbon dioxide in water solution in the aquifer.

Mentioned distinguishing particularity of the atmospheric precipitation 1983r. wholly can be by necessary (but not sufficient) by probable reason, which could aid an triggering of the limnological catastrophes.

The calculation of the gaseous ejections from the sediment stratum of lakes "NYOS" and "MONOUN" in CAMEROON (1), executed by computer program "SONATA", has shown, that in 1983 the mole-fraction of the carbon dioxide in water solution, which are flowing in the pressure confined aquifer under lake's bottom, is increased till anomalous high importances in contrast with the mole-fraction of any other year of the period with 1929 till 1988.

Anomalous high importance the mole-fraction of the carbon dioxide in the water solution in 1983 was showed up by the sufficient condition of the triggering of limnological catastrophes on lakes "NYOS" (1986) and "MONOUN" (1984).

Hereunder, calculation with using of the program "SONATA" has confirmed (1) that above said the distinguishing particularity of the atmospheric precipitation 1983r. was showed up not only necessary but also(as well as) sufficient condition, which has leted of triggering of the limnological catastrophes on lakes "NYOS" (1986) and "MONOUN" (1984).

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

**Nataliya Anatolievna Solodovnik
(Natalija Solodovnika)**

The Slopping of line of regressions on **Fig.3., Fig.4., Fig.5., Fig.6., Fig.7., Fig.8.** is indicative of progress during of twentieth century of the process the reduction of the total amount of atmospheric precipitation, falling out since November till May .

If this process will not be changed, that as likely as not repetition during of twentieth first century of the limnological catastrophes in lakes "NYOS" and "MONOUN" in CAMEROON.

Furthermore, combination of the progress of the mentioned process with reduction on 20 metres of the height of the dam and level of water in lake "NYOS", about which are saided in report of the delegations "Joint UNEP/OCHA Environment Unit" (2),(3), will greatly magnifies probability and the destructive power of the limnological catastrophes in lake "NYOS".

Conclusion

The Distinguishing particularity 1983 in contrast with any other year of the period with 1929 till 1988 is such, that the value of the amount of atmospheric precipitation, falling out in vicinities of lakes "NYOS" and "MONOUN" in CAMEROON with November 1982 till May 1983 has smaller importance in contrast with importances of the similar values for any other year of the period with 1929 till 1988.

The Mentioned distinguishing particularity 1983 was necessary and sufficient condition of triggering of the limnological catastrophes in lake "MONOUN" in 1984 and in lake "NYOS" in 1986.

In the event of conservation in twentieth first century typical for twentieth century of the trends of the reduction of the amount of the atmospheric precipitation, falling out with November till May in vicinities of lakes "NYOS" and "MONOUN" in CAMEROON, must expect more frequent and more destructive of the limnological catastrophes in the lake.

Reduction on twenty metres of the height of the dam in lake "NYOS" will enlarge probability and the destructive power of the limnological catastrophes in the lake

The List of the literature.

1. **Н.А.Солодовник, А.Б.Солодовник, «Механика включения спускового механизма лимнологических катастроф, произошедших в Камеруне на озере «MONOUN» в 1984г. и на озере «NYOS» в 1986г., воздействием атмосферных осадков в 1983 г. », Рис1, Рис2, Рис3, Рис8., <http://www.nyos.lv/>;**
2. **Н.А.Солодовник,А.Б.Солодовник, «КАТАСТРОФИЧЕСКИЕ ПОСЛЕДСТВИЯ Понижения на двадцать метров уровня воды в озере “NYOS” в Камеруне, которые не учтены в отчете об оценке дамбы на озере “NYOS” делегацией «Joint UNEP/OCHA Environment Unit», посетившей Камерун в сентябре 2005 года.», <http://www.nyos.lv/>;**
3. **«Lake Nyos Dam Assessment», «Joint UNEP/OCHA Environment Unit», Cameroon, September 2005. <http://ochaonline.un.org/ochaunep>**
4. Michel Halbwachs, Jean-Christophe Sabroux, Jacques Grangeon, Gaston Kayser, Jean-Claude Tochon-Danguy, Alain Felix, Jean-Christophe Beard, Adelin Villevieille, Gerard Vitter, Patrick Richon, Alfred Wüest and Joseph Hell, "Degassing the "Killer Lakes" Nyos and Monoun, Cameroon", EOS, volume 85, number 30, 27 July 2004, pages 281-288.,
5. George W.Kling, William C.Evans, Greg Tanyileke, Minory Kusakabe, Takeshi Ohba, Yutaka Yoshida, "Degassing Lakes Nyos and Monoun: Defusing certain disaster", PNAS, October 4, 2005, vol.102, no.40, 14185-14190.,

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

**Nataliya Anatolievna Solodovnik
(Natalija Solodovnika)**

6. Martin Schmidt, Andreas Lorke, Alfred Wüest, Michel Halbwachs, Gregory Tanyileke, “Development and sensitivity analysis of a model for assessing stratification and safety of Lake Nyos during artificial degassing, *Ocean Dynamics* (2003)53: 288-301.,
7. Martin Schmidt, Michel Halbwachs, Bernhard Wehrli and Alfred Wüest, “Weak mixing in Lake Kivu: New insights indicate increasing risk of uncontrolled gas eruption”, *Geochemistry Geophysics Geosystems G³*, Volume 6, Number 7, 26, July 2005, 1-11.,
8. G.Nelson Eby and William C.Evans, Feature. Taming the killer lakes of Cameroon, *Geology Today*, Vol.22, No.1, January-February 2006.
9. http://bonnet19.cs.qc.edu:7778/pls/rschdata/rd_prpcp.show_prpcp_data.

Notice

This publication is an integral part and translation of the original: Н. А.Солодовник , « ОСОБЕННОСТЬ АТМОСФЕРНЫХ ОСАДКОВ В ОКРЕСТНОСТЯХ ОЗЁР «NYOS» И «MONOUN» В КАМЕРУНЕ В 1983г., КОТОРАЯ ОТЛИЧАЕТ ИХ ОТ АТМОСФЕРНЫХ ОСАДКОВ В ЛЮБОЙ ДРУГОЙ ГОД ПЕРИОДА С 1929г. ПО 1988г.», <http://www.nyos.lv/>. Any questions of this publication must be resolving according to original.

**«PARTICULARITY of the ATMOSPHERIC PRECIPITATION
In the VICINITY OF LAKES "NYOS" And "MONOUN" In CAMEROON At 1983, WHICH DISTINGUISHES THEM FROM
ATMOSPHERIC PRECIPITATION At ANY OTHER YEAR of the PERIOD With 1929 Till 1988.»**

Nataliya Anatolievna Solodovnik
(Natalija Solodovnika)