

The Gelasian GSSP approved by ICS and ratified by IUGS!

In the following pages, we reproduce the formal submission of the proposal of the Gelasian GSSP to the ICS, after the approval by SNS.

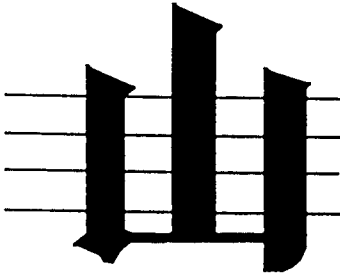
The submission include the formal recommendation of SNS to ICS, the results of the postal ballot within SNS, the letters of those SNS members (Antunes, Benson, Martinell, Martinotti, Suc and Zachariasse) who did not approve it and the related, detailed, answers by the proponents (Rio, Sprovieri, and Di Stefano).

The Gelasian GSSP has been very recently approved by ICS and ratified by IUGS and thus constitutes one of the most important achievements of our subcommission in the last few years!

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES

INTERNATIONAL COMMISSION ON STRATIGRAPHY

SUBCOMMISSION ON NEOGENE STRATIGRAPHY SNS



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March 29, 1996

Professor O. Michelsen
Secretary General, ICS
Department of Earth Science
Aarhus University
DK-8000, Aarhus C
Denmark

Dear Professor Michelsen,

this is the formal submission of the recommendation of the Subcommittee on Neogene Stratigraphy (SNS) to the International Commission on Stratigraphy for the definition of the Gelasian, a new stage proposed as the third uppermost part of the Pliocene Series:

The base of the Gelasian stage is defined at the base of the marly stratum overlying the prominent sapropelic Nicola Bed, correlative to precessional cycle 250, in the Monte San Nicola section, near the town of Gela, Southern Sicily, Italy.

The newly proposed stage appears to be recognizable on global scale by means of various correlation tools (bio-, magneto-, astrocylo-, climatostratigraphy) in both continental and marine realms.

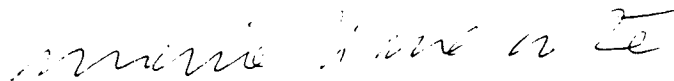
Technical information requested by current ICS guidelines for establishing GSSP are provided in the enclosed paper by Rio, Sprovieri and Di Stefano (1994), which has widely circulated among the scientific community. The Gelasian Stage has met with a wide approval and it is

already being used in practical stratigraphic work in Italy and elsewhere (e. g. Beu, 1995, *Pliocene Limestones and their Scallops*, Monograph 10 of the Institute of Geological and Nuclear Sciences Ltd., Lower Hutt, New Zealand; Curry, Shackleton, Richter, *et al.*, Proc. of ODP Initial Reports, Vol. 154, 1995) and it has been incorporated in the recently proposed Cenozoic Time Scale of Berggren *et al.* (in the *SEPM Special Publication* # 54, 1995) and also in Berggren, Hilgen *et al.* (*GSA Bulletin*, 1995).

Please find enclosed 25 copies of this cover letter and reprints of the paper by Rio *et al* (1994) for distribution to the Full Commission, ICS.

The proposal of the Gelasian stage passed by a wide majority in the SNS as reported in Table 1. Doctors Antunes, Benson, Martinell, Martinotti, Suc and Zachariasse have voted against the introduction of the Gelasian Stage on the base of various motivations which are reported in Appendix 1 together with the reply of Rio, Sprovieri and Di Stefano.

Respectfully Submitted



Maria Bianca Cita
Chair of the Subcommission of the Neogene Stratigraphy
Department of Earth Science
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(Italy)

TABLE 1

Voting member	in favor	no vote	against
Cita, M.B. (chair)	*		
Alekseev, M.N.	*		
Alvinerie, J.	*		
Antunes, M.T.			*
Aubry, M.P.	*		
Barron, J.	*		
Benson, R.H.			*
Berggren, W.A.	*		
Civis, J.		*	
Gelati, R.		*	
Gladenkov, J.	*		
Hinsch, W.	*		
Iaccarino, S.M.	*		
Ingle, J.	*		
Jenkins, D.G.	*		
Kennett, J.P.		*	
Kent, D.V.		*	
Kovac, M.		*	
Magné, J.		*	
Martinell, J.			*
Martinotti, G.			*
Meyer, K.J.		*	
Padron, V.		*	
Pinxian, Wang		*	
Rio, D.		*	
Semenenko, V.N.		*	
Steininger, F.F.	*		
Suc, J.P.			*
Tsuchi, R.		*	
Zachariasse, J.W.			*

THE WORLD STANDS ON THREE FOUNDATIONS:
ON STUDY, ON SERVICE AND ON BENEVOLENCE.
(Ethics of the Fathers, 1, 2)

Prof. Maria Bianca Cita
Dipartimento di Scienze della Terra
Via Mangiagalli 34
20133 Milano
ITALIA

Your reference: 21 May 95
My reference: GMM/311-29
Jerusalem, 9 July 1995

Dear Maria Bianca,

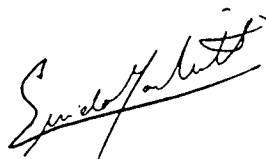
it is unpleasant for me indeed to oppose the proposal of well known and greatly appreciated scientists regarding a Gelasian stage. This is particularly true after their accurate work. I personally know Sprovieri; he advised me several times, always showing remarkable accuracy and wisdom; he is also from the staffs of Ruggieri, my most appreciated teacher in geological sciences.

But as a pragmatic biostratigrapher, I often face the problem of using already accepted terms which relate to intervals that lack clear biostratigraphic-events at boundaries, and therefore hamper long-distance correlations. This would also be the case of Gelasian.

No doubt that chronostratigraphy differs from biostratigraphy, stages from biozones. But my pragmatic approach to the matter is as follows: a new stratigraphic term is superfluous, if only it can be approximately used as one understand from Riv. It. Paleontol. Strat., v. 100, n. 1, p. 115 and 119-120, 1994. The stratigraphic terminology is already cumbersome enough.

It seems also proper waiting the 14th INQUA Congress of this August, for better learning on the Plio-Pleistocene boundary.

Sincerely yours,



Guido Menahem Martinotti

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FOLHA DE ENVIO DE TELEFAX
TELEFAX COVER SHEET

PARA: Dr. Janos HALMAI / Hungarian Geological Institute, XIV. Népstadion
TO: út 14, POB 17, H-1440 Budapest Fax: 36 1 2510703

EMETENTE: Prof. Miguel Telles ANTUNES
FROM:

Nº TOTAL DE PÁGINAS (incluindo esta): 2
TOTAL NUMBER OF PAGES (including cover sheet):

DATA: 30. V. 1995
DATE:

MENSAGEM:
MESSAGE:

Dear Colleague

I send you, along with my vote concerning the election of Chairman and 3 Vice-Chairmen of the SNS 1996-2000, my vote about Gelasian proposal.

I received some comments from J. P. SUC (Montpellier) and I agree with them. I therefore do not agree with the concerned proposal.

Sincerely yours

Miguel Telles Antunes



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Dr J. Halmai
Secretary SNS
Hungarian Geological Survey
H-1440 Budapest pf 17

Barcelona, May 25th, 1995

My vote is against the approval of the Gelasian as the third and uppermost stage for the Pliocene. The actual circumstances suggest a somewhat cautious attitude in front of it, specially considering that the chronostratigraphy of the Pliocene-Pleistocene boundary is not solved yet and discussion about it is going on (for an example, the next meeting of the INQUA in Berlin next August).

On the other hand, the Zanclean/Plasencian subdivision of the Pliocene has international agreement and has been tested successfully. The acceptance of this new stage would involve too many changes to accept it without taking into account all the implications derived from it or before demonstrating its presence in other regions.

Jordi Martinell
Vice-President of the Regional Committee
on Mediterranean Neogene Stratigraphy

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Jean-Pierre SUC

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I am against the creation of the Gelasian as new stage within the Pliocene for several reasons.

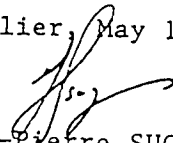
The use of two stages, the Zanclean and the Piacenzian, subdividing the Pliocene, is now world-widely accepted and I consider that the addition of a new stage should provoke unnecessary confusion.

Scientific progresses in chronostratigraphy (cyclostratigraphy and magnetostratigraphy mainly) as well as in knowledge of the climatic evolution demonstrate that the present-day location of the Pliocene-Pleistocene boundary in the Vrica section (near the top of the Olduvai event) does not correspond to a major break at the difference of the changes which occurred near the Gauss-Matuyama reversal.

In addition, there is a proposal for a new definition (at the Gauss-Matuyama reversal) of the Pliocene-Pleistocene boundary which is to be discussed at the 14th INQUA Congress (Berlin, August 1995). Such a chronostratigraphic location appears more reliable and easier to distinguish both in marine and continental records than the present-day boundary. The proposal includes as boundary stratotype the section of Monte San Nicola (Sicily), the Gauss-Matuyama reversal being not recorded at the base of the Crotona series.

So, it is clear that the question to debate greatly exceeds the establishment of a new Pliocene stage and should be discussed taking into account all the concerned aspects.

Montpellier, May 10th, 1995.



Jean-Pierre SUC
President of the Regional Committee
on Mediterranean Neogene Stratigraphy
Member of the INQUA Commission on
Stratigraphy.

FAX MESSAGE

FACULTY OF EARTH SCIENCES
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MESSAGE FROM:

TO: Prof. J. Halmaj

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TOTAL NUMBER OF PAGES : 1

Dear Dr. Halmaj,


Since I am afraid that a letter will not reach by June 1 I send you my opinion about the Gelasian Stage by fax. The ballot will be send by post.

I have read the proposal for a GSSP of the Gelasian Stage with interest, but I realized that what I actually read was a plea for dividing the Pliocene in three parts by splitting the 'old' Piacenzian Stage (of 1.8 Ma) into a 'new' Piacenzian Stage (of 1 Ma) and Gelasian Stage (of 0.8 Ma).

The reason for this chronostratigraphic refinement is (at least according to my understanding) that the Piacenzian stratotype section covers only part of the 'old' (extended) Piacenzian Stage. In fact this is nothing to get upset about and seems to me no compelling argument to introduce the Gelasian Stage (with the consequence of adjusting the geological map of Italy and possibly that of other countries).

I am of the opinion that we can better keep the traditional 2-stage division of the Pliocene in which the time length of the Zanclean is more or less equal to that of the Piacenzian. Within this concept it is important to accept the proposed GSSP for the Zanclean/Piacenzian (=lower/upper Pliocene) boundary at Punta di Maiata as soon as possible.

Best regards,


Jan Willem Zachariasse

BENSON (1st of two)

To: Professor Maria B. Cita

From: Dr. Richard H. Benson

Smithsonian Institution
Museum of Natural History, 10th &
Constitution Ave
Washington, D.C.
01 (202) 357 2970/01
Fax (202) 786-2832

Date: July 26, 1995

Subject: SNS Vote on the Gelasian Stage

Dear Maria,

My vote on the proposal submitted for the GSSP of the Gelasian is NO. The reasons are attached. If it passes SNS, I will be hard to write a minority opinion.

Note that proposal written by Rio *et al.* is addressed to the acceptance of a new chronostratigraphic unit, not as your announcement says for the "ratification" of its GSSP. These are two issues. Without demonstration of the validity of the Gelasian as a globale stage I cannot support the proposed designation of its GSSP.

I must warn you that I think the arguments presented are fallacious in terms of construction and the roles of reference standards. If this passes, I will insist that the same logic presented here be used in defense of changing the Pliocene GSSP. Please study this carefully. Sorry to disagree. Nothing personal, of course.

BENSON (2nd of two)

The Gelasian Stage as proposed by Rio, Sprovieri & Di Stefano, 1994

1. The case made for the need is not sufficient. History has nothing to do with stratigraphic boundaries (bottom, p.107, also refer to ICS Guidelines and discussions by Harland).

The argument that it completes the record between the top of the Piacenzian as represented at Castell'Arquato and the Pleistocene GSSP at Vrica is irrelevant. It is sufficient to define the Piacenzian as the interval of time represented between its lower boundary. The upper boundary is automatically defined. The purpose of GSSPs is to accommodate incomplete records. The geologic record is full of incomplete sequences that overlap, but are not satges.

The Pliocene chronologically divided into two vs. three parts:

Gelasian; 2.589 to 1.83 Ma = 0.76 myrs

Piacenzian; 3.5 to 2.589 Ma = 0.91 "

Zanclean; 5.32 to 3.5 Ma = 1.82 "

The Piacenzian as now constituted is 1.67 myrs; half of the Pliocene total = 3.49
So what is the need to divide the Pliocene further and unequally?

2. The biostratigraphy is largely based on nannos, of the presence of evidence of certain zones in the section (NN 15-19, etc.). The figures indicate several biostrat events, but their significance for global correlation of the geomagnetic change is not discussed. Also a quick check of Berggren's latest chart shows the limit chosen falls in the middle of N-21, maybe at the lower limit of the *Gl. toasensis* Zone, not mentioned in the text. The LAD of *Discoaster pentaradiatus* is given (shown on Fig 7), but the significance for its identification of the Gauss/Matuyama polarity reversal outside of the Italian region is not given. *Gl. bononiensis* is not found outside the Mediterranean.

3. The placement of the boundary at a cyclic lithologic marker is less useful for global correlation than at the geomagnetic reversal (not just close, p. 117). Geomagnetic reversals are global, but precession cycles (at this time) are largely marine. The GSSP position is better indicated in Raymo's N. Atlantic isotopic curve than on the section description (the GSSP level is not indicated on Fig. 7). Have precession cycles been dated in upper Pliocene lake deposits? A GSSP is global. The point should have been indicated at the G/M limit and as so many meters from the conspicuous sapropel layer and by a marker and reference to a benchmark.

4. My opinion is that if the Italians want this as a local stage, they have the right to use it. The case made for the need of another global stage is weak. The case made for global correlation (p. 177) is incomplete or backwards. The fact that it is close to the final build-up in northern hemisphere glaciation is irrelevant in stratigraphy. Proximity to the Gauss/Matuyama Chron boundary is already usable for that. Referring to the "Piacenzian/Gelasian" boundary adds uncertainty. Partitioning the "composite Pliocene section" does not increase stratigraphic resolution in the Pliocene. That was done when M. S. Nicola section was correlated with the North Atlantic. The "reference" then shifted to the N. Atlantic, which has global significance. Introducing a new division adds nothing to correlation, except perhaps for discussion in Italy.

5. The paper is interesting, represents a lot of good work, and is useful. It has a few false assumptions, however. The Pliocene is not really Italian (any more than Roman Catholicism). not is Sicily, to hear the Sicilians tell it. This argument has the cart before the horse.

REPLY OF D. RIO, R. SPROVIERI AND E. DI STEFANO

Drs. Antunes, Benson, Martinell, Martinotti, Suc, and Zachariasse have voted against the proposal of introducing the Gelasian stage on the ground of two similar motivations: 1) the introduction of the Gelasian is untimely because it interferes with the discussion raised by members of INQUA on the definition of the Plio-Pleistocene boundary (Suc, Antunes, Martinell); 2) a threefold subdivision of the Pliocene is awkward because against the well established practice of its twofold subdivision (Martinotti, Suc, Zachariasse). Dr. Benson raises several arguments and expresses views contrasting with those of the other members who have voted against the introduction of the Gelasian. In the following we comment on the two first items and the arguments of Benson.

1) The Gelasian and the Plio-Pleistocene boundary

Drs. Suc, Antunes and Martinell argue that it is premature to propose a new Pliocene stage because they state that the definition of the Plio-Pleistocene boundary is not settled. Actually, they are in favor of defining the base of the Pleistocene in correspondence to the proposed base of the Gelasian, on the grounds of its wide correlativeity. We are rather surprised of the statement that the P-P boundary definition is not settled because 1) the GSSP of the base of the Pleistocene has been formally approved in the Vrica section at the IGC of Moscow in 1984, after a long and hard work of joint INQUA and SNS working groups; 2) -the Vrica-top Olduvai definition has been and is being satisfactorily widely used in practical stratigraphic work (see for example the vast ODP literature, Berggren et al., 1985, Haq et al., 1988, Berggren et al., 1995, etc.).

We would also stress that the Gelasian is proposed as a stage, while the Pleistocene is Series-Epoch: we would like to know from those proposing the base of the Pleistocene at about 2.6 Ma which is the first (oldest) Pleistocene stage? As a matter of fact within the INQUA Working Group on the definition of the Plio-Pleistocene boundary (Chair Partridge) dr. Suc is sponsoring a GSSP of the Pleistocene in the Monte San Nicola section corresponding to our Gelasian GSSP. So what is the matter between our proposal and the querelle on the Plio-Pleistocene boundary? If we have to move the base of the Pleistocene at 2.6 Ma (and we hope not), the Gelasian would simply become the first stage of the Pleistocene.

2) Is a three-fold subdivision of the Pliocene confusing and against tradition?

Drs. Suc, Martinell, Antunes and Zachariasse argue that the two-fold subdivision of the Pliocene is widely accepted and the introduction of a third upper stage and, consequently, a

threefold subdivision can be confusing and not in agreement with tradition. Actually, this is a serious argument, and it has been the reason why we have been reluctant for many years to make our proposal. We have explained in our paper (see also Rio and Sprovieri, 1994) the main reason for promoting a change of a practice which had become widely established: because of the climatic contrasts people were subdividing the upper Pliocene into "preglacial" and "glacial" upper Pliocene and we just proposed to formalize this practice. However, it should be remembered that the two-fold subdivision of the Pliocene has become a widely accepted practice only in the last 20 years. In the past the Pliocene has been predominantly subdivided into three stages (e.g. Zanclean (Tabianian)-Piacenzian-Astian). In Italy, following Ruggieri and Selli (1950) and Colalongo et al (1974) the threefold subdivision of the Pliocene is the dominant practice even today. On the other side, those (like Suc, Martinell, and Antunes) who want to shift down the base of the Pleistocene around the Gauss-Matuyama boundary feel the need, as we do, of recovering to the Global Chronostratigraphic Scale a point of the geologic time of easy correlation. With a major difference: for us the base of the Gelasian belongs to the Pliocene in agreement with a more than a century long practice dating back to Lyell. Shifting the base of the Pleistocene down to the base of the Gelasian would be a useless major upset of marine stratigraphy.

3) Benson remarks

We reply point by point to the Benson's remarks:

a) Benson states that "history has nothing to do with stratigraphic boundaries". Actually in the last version of the ICS Guidelines for establishing Global Chronostratigraphic Standards (Remane et al., manuscript June 1995) it is stated (item 3.2.1): "...Practical considerations will, however, encourage us to respect the traditional boundary as far as possible". The International Stratigraphic Guide (1994, p. 91) states: "The selection of the boundary-stratotypes of chronostratigraphic units of the Global Chronostratigraphic Scale, where possible, should take account of historical priority and usage and should approximate traditional boundaries".

It is irritating that dr. Benson considers our motivation for introducing the Gelasian the gap between the top of the Piacenzian stratotype and the base of the Pleistocene defined in Vrica. We are old enough to know that this is not a reason for introducing a new stage! Our motivations were essentially founded on the convenience and utility of distinguishing in the Global Chronostratigraphic (Geochronological) Scale an interval of geologic time which is easily recognized and correlated on global scale, thus refining chronostratigraphic resolution. On the other side, it seemed to us important to remark that the proposed revision does not violate the position in time of the historical stratotypes and does not demand a major upset of

the existing literature. The proposed Gelasian corresponds grossly to the never properly defined "Pliocene superiore" of Ruggieri and Selli (1950) and to the (invalid) Astian stage of the literature (See Rio and Sprovieri, 1994).

b) We have given more nanno biohorizons because this fossil group provides better long-distance correlation tools than planktonic foraminifera in the late Neogene. Actually, the chronologic significance of planktonic foraminifera datums in a specific biogeographic province must be determined before it can be confidently used. However, it is not true that *G. bononiensis* is unknown outside the Mediterranean region. It is generally referred to as *G. puncticulata* and it disappears in the north Atlantic in correspondence with oxygen isotope stage 96 (i.e. close to the base of the Gelasian) as it does in the Mediterranean (see Zachariasse et al., 1990)

c) Dr. Benson considers that GSSPs must be defined by magnetic polarity reversals. This is a personal view, however. For example, Harland (1992) stated that "magnetostratigraphy is just one factor for locating GSSPs and then for correlating them". Biostratigraphers wanted the boundary defined with a biohorizon. Probably other specialists like isotopic or geochemical features. Our strategy has been the one recommended by the above quoted ICS Guidelines (item 3.2.3): "... the boundary level should be chosen to lie within a bundle of successive events, which allow good approximate correlations in the absence of the primary marker". We note that the precise location of magnetic polarity reversal in a stratigraphic section is not as straightforward as one would like (delay in the acquisition of the remnant natural magnetization, diagenetic complications, etc.). We have preferred to privilege the easy identification in the field of the GSSP (the Nicola Bed is so prominent that it is the first feature you see in the section) and the precision in assessing its geochronology derived by astrocyclostratigraphy.

d) Dr. Benson states that the Gelasian has the rank of a regional stage and not a global one, because "the fact that it is close to the final build-up of the northern hemisphere glaciation is irrelevant to stratigraphy". This statement sounds ironical to us. The other members quoted above which voted against the Gelasian consider so important this climatic change that they want the base of the Pleistocene defined with it! We believe that the truth is in between. We are not allowed to adjust chronostratigraphy on the basis of climate, but major climatic changes prompt a wealth of stratigraphic signals which can be used for correlation and thus in refining chronostratigraphic standards. We disagree that introducing the easily recognized Gelasian stage does not add to the refinement of chronostratigraphic correlation: it makes a difference if we can consistently use three rather than two division of the Pliocene in the scientific communication.