PALYNOLOGY AND PALYNOFACIES ANALYSIS OF THE LLANDOVERY-WENLOCK LA CHILCA FORMATION, ARGENTINA

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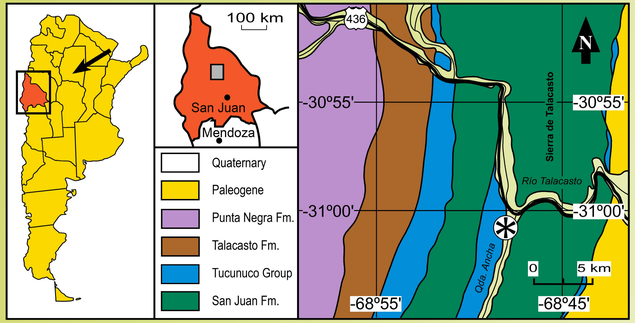


Introduction

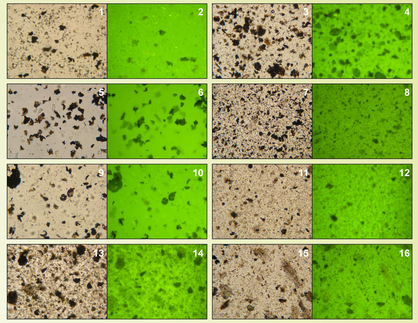
The Silurian deposits of the Argentinian Central Precordillera are represented in the Tucunuco Group, composed of the La Chilca and the Los Espejos formations. The La Chilca Formation was extensively studied in the last fifty years; however fossil records were sparse, and mainly constrained to the lower and middle part of the stratigraphic unit. A transgressive to high sea-level stand history can be tracked for the La Chilca Formation.

The base is indicated by a conglomerate level succeeded by grayish -dark green pelites with occasional dark shaly intervals interpreted as inner shelf. Upwards, the increase of sandstone beds evidences gradual thickening and coarsening, indicating a more proximal environment.

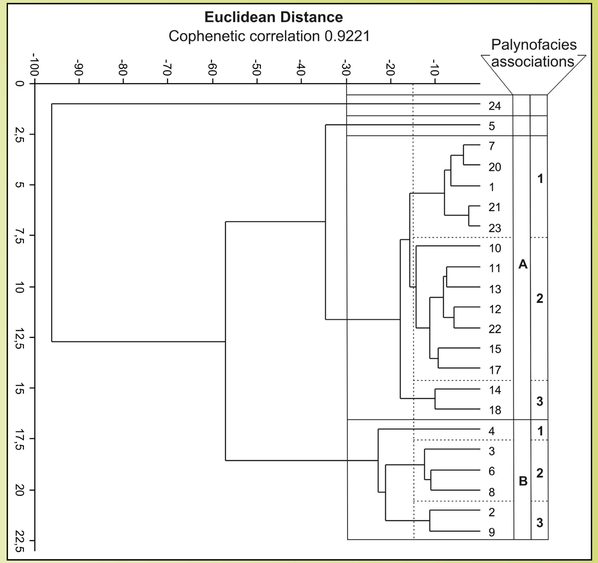
Results and Discussion

Twenty-three samples from the Quebrada Ancha section are analyzed. Marine palynomorphs are abundant and highly diversified in the entire stratigraphic unit. These are, represented by 64 species, including statigraphically relevant taxa. Terrestrial palynomorphs constitute less than 3% of the assemblage, with only 5 species. The La Chilca Formation was constrained to Hirnantian? - Homerian (Late Ordovician?-Late Wenlock), based on the phytoplankton assemblages distribution in the Quebrada Ancha Section. (García, 2014; García Muro & Rubinstein, 2015).

Comparisons to coetaneous assemblages from Gondwana and other paleoplates such as Laurentia, Baltica and Avalonia evidence strong similarities among them. This suggests the lack of provincialism of the Llandovery and Wenlock marine phytoplankton.



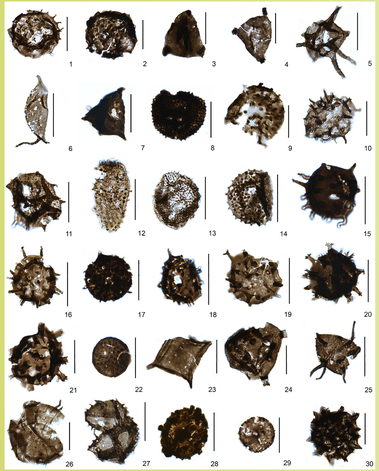
1. Level 24
2. Level 24 Fluorescence mode
3. Level 5
4. Level 5 Fluorescence mode
5. A1. Level 21
6. A1. Level 21 Fluorescence mode
7. A2. Level 15
8. A2. Level 15 Fluorescence mode
9. A3. Level 14
10. A3. Level 14 Fluorescence mode
11. B1. Level 4
12. B1. Level 4 Fluorescence mode
13. B2. Level 3
14. B2. Level 3 Fluorescence mode
15. B3. Level 2
16. B3. Level 2 Fluorescence mode



The palynofacies analysis is performed trough a cluster diagram that allows the differentiation of two main associations: A and B. Palynofacies association A is characterized by the most elevated percentage of translucent possible palynomorph remains (mainly phytoplankton). Palynofacies association B is characterized by the highest frequencies of AOM (Amorph Organic Matter). Each of them is subdivided into three sub-associations, 1-3, grouped according to the percentages of the different categories of the organic matter: AOM, palynomorph remains and phytoplankton.

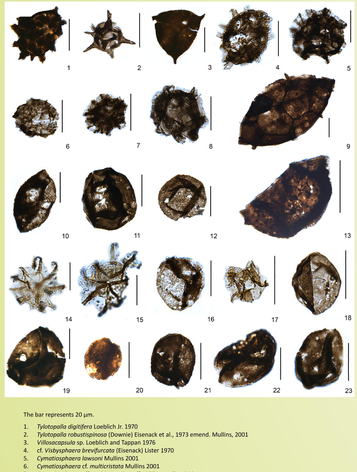
The TOC (Total Organic Matter) values display three main peaks. The lowermost one occurs in the lower part of the section, in the laminated pelite, probably deposited in anoxic conditions causing high preservation of organic matter while the remaining two peaks, in the middle to upper part of the section. The latter could be interpreted as sea level rise episodes that have probably produced anoxic conditions, allowing better preservation of the organic matter and pointing to a fluctuating shallowing system.

The AOM is probably derived from the degraded phytoplankton. This would explain why the percentage of AOM increases while the percentage of palynomorph remains decreases, and vice versa. The palynofacies analysis allows the recognition of minor environmental changes in the section such as possible flooding and anoxia events, also suggesting the response of phytoplankton to those changes.



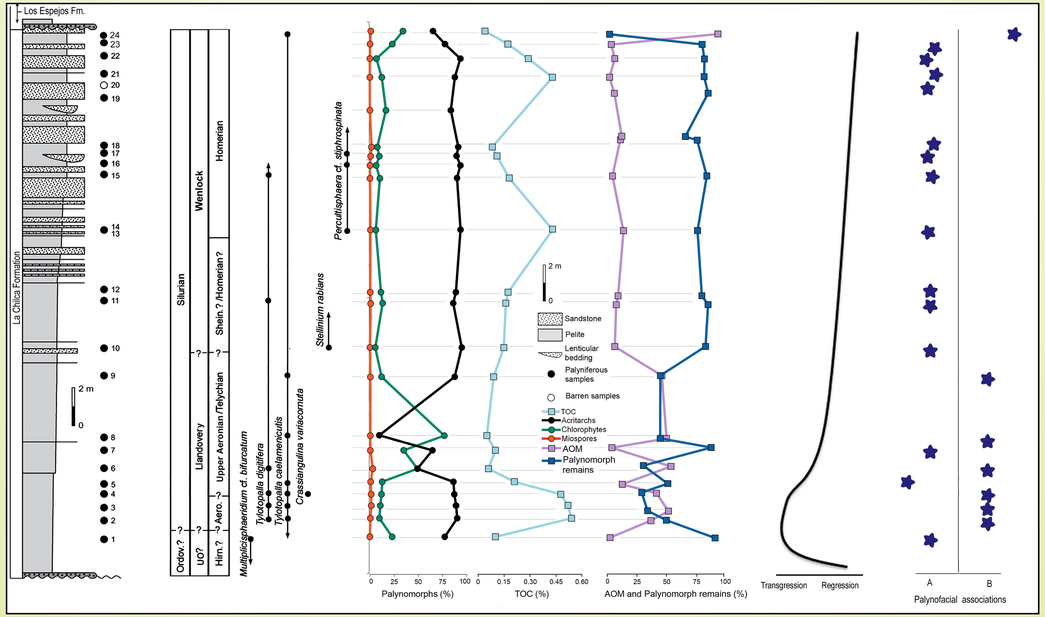
The bar represents 20 µm.

1. *Ammonidium microcladum* (Downie) Lister 1970
2. *Buedinisphaeridium lunatum* Le Hérissé 1989
3. *Crassiangulina tesselitta* Jardiné et al. 1972 emend. Wauthoz et al. 2003
4. *Crassiangulina variacornuta* Wauthoz et al. 2003
5. *Dieseliphasis remota* (Deuriff) Playford 1977, Group Mullins, 2001
6. *Domasia trispinosa* Downie 1960
7. *Dorsenidium europaeum* (Stockmans and Willière) Sarjeant and Stancliffe 1994 emend. Mullins 2001
8. *Gorgonisphaeridium citrinum* (Downie) Mullins 2001
9. *Gorgonisphaeridium saharicum* (Lister) Sarjeant and Vavrdová 1997
10. *Gorgonisphaeridium spinosum* Pöthe de Baldis 1974
11. *Gyalorhethium* sp.
12. *Helosphaeridium clavispinosum* Lister 1970
13. *Helosphaeridium pseudodictyum* Lister 1970
14. *Lophosphaeridium parverarum* Stockmans and Willière 1963
15. *Micrhystridium angustum* Staplin 1961
16. *Micrhystridium intonsarons* (Lister) Dorning 1981
17. *Micrhystridium*? sp.
18. *Micrhystridium*? sp.
19. *Multiplicisphaeridium* cf. *bifurcatum* Staplin et al., 1965
20. *Multiplicisphaeridium robertium* (Cramer) Lister 1970
21. *Multiplicisphaeridium rochesterensis* (Cramer and Diez) Eisenack et al., 1973
22. *Nanocyclopia* sp.
23. *Neoveryhachium carminae* (Cramer) Cramer 1970
24. *Ozotobrachion cilindros* Pöthe de Baldis 1981
25. *Percutisphaera* cf. *stphinospinata* Lister 1970
26. *Percutisphaera incompta* Richads and Mullins 2003
27. *Paenetopus* sp.
28. *Schimatosphaeridium guttulaferum* Le Hérissé 1989
29. *Schimatosphaeridium* sp. B in Le Hérissé 1989
30. *Tylotopalla caelamenicutis* Loeblich 1970



The bar represents 20 µm.

1. *Tylotopalla digitifera* Loeblich Jr. 1970
2. *Tylotopalla robustispinosa* (Downie) Eisenack et al., 1973 emend. Mullins, 2001
3. *Villosacapsula* sp. Loeblich and Tappan 1976
4. cf. *Visbysphaera brevifurcata* (Eisenack) Lister 1970
5. *Cymatiosphaera lawsoni* Mullins 2001
6. *Cymatiosphaera* cf. *multicristata* Mullins 2001
7. *Cymatiosphaera* aff. *multiseptа* Deuriff 1955 in Mullins 2001
8. *Cymatiosphaera velicarina* Wicander 1974
9. *Dictyotidium biculatulum* Kiryanov 1978
10. *Dictyotidium alexdatum* (Kiryanov) Le Hérissé 1989
11. *Dictyotidium* cf. *amydrum* (Tappan and Loeblich) Eisenack et al., 1979
12. *Dictyotidium fovéforme* Schultz 1967
13. *Dictyotidium stellatum* Le Hérissé 1989
14. *Duplicirradiatum* sp.
15. *Duplicirradiatum* sp.
16. *Melikeriopalla polygonia* (Staplin) Mullins 2001
17. *Stellinium rabians* (Cramer) Eisenack et al., 1976
18. *Lanvoiancs diveltomedium* (Chibrikova) Burgess and Richardson 1991
19. cf. *Imperfectostriletes vavrdovae* (Richardson) Steemans et al., 2000
20. *Pseudodyadospora laevigata* Johnson 1985
21. *Rugosphaera cerebra* Millar and Eames 1982
22. *Tetrahedralites medionensis* (Strother and Traverse) Wellman and Richardson 1993
23. *Vinkstetaires retimembranae* (Miller and Eames) Wellman and Richardson 1996



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