Terranes In The
Circum-Atlantic Paleozoic Orogens

* UNIVERSITY OF OVIEDO, SPAIN
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INTERNATIONAL CONFERENCE ON IBERIAN TERRANES AND THEIR REGIONAL CORRELATION

GEOTRAVERSE SOUTH (B-1) EXCURSION GUIDEBOOK

INTERNATIONAL CONFERENCE ON IBERIAN TERRANES AND THEIR REGIONAL CORRELATION

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GEOTRAVERSE SOUTH

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due to superimposition.

c) The "appalachian" type morphology of the basement, rising as island-mountains over the plain, with "hanged" synclines near the Miravete Pass made up of lower Ordovician quartzites, while in the depressed anticlinal cores, the Precambrian rocks are found.

Towards the South, the morphology is quite different, with successive peneplains cut in the slates covered by discontinuous recent bahada-type sediments or "rañas" and residual Tertiary sediments, occassionally separated by quartzitic ridges or post-kynematic granites with metamorphic aureoles.

STOP 1-10
Road N-V, bridge on the Tozo River. River bed and roadcut outcrops.

Core of a Hercynian anticlinorium with NW-SE direction, where Precambrian deformations are seen discordant with the Hercynian structural directions. In the river bed, mesoscopic folds with subvertical hinges are crossed by the first Hercynian schistosity in a lower Alcudian succession, more than 7,000 m thick made up of alternating shales and graywackes in thin beds that could be od distal turbiditic character.

In the roadcut, more than 100 m of a typical lower Alcudian sequence are observed, also affected by folds with subvertical hinges. They are thick alternating medium ti coarse grained graywackes with shales and conglomerates not grain-supported. This succession is interpreted as deposited in a submarine fan.

DAY 2 (HERRANZ, P., SAN JOSE, M.A. de, PEREJON, A., PIEREN, A.P. & GARCIA-HIDALGO, J.F., Instituto de Geologia Economica, C.S.I. C.,Universidad Complutense de Madrid, 28040 MADRID,Spain

ITINERARY

Trujillo - Herguijuela - Conquista - Zorita - Madrigalejo - Acedera - Orellana - Orellana Reservoir (STOP 2-1) - Orellana Dam - Valdivia - Villanueva de la Serena - La Haba (cimetery)(STOP 2-2) - La Haba - La Guarda - Quintana de la Serena - (STOP 2-3) - Zalamea - Peraleda de Zaucejo (STOP 2-4) - Zalamea - Higuera de la Serena - Retamal - Puente de Arroyo Herrumbral (STOP 2-5) - Valle de la Serena - Cortijo de los Meregiles (STOP 1-6) - Puebla de la Reina - Palomas (STOP 1-7) - Palomas (STOP 1-8) - Alange (STOP 1-9) - Alange Dam (under construction) (STOP 1-10) - Pajares del Encinar (STOP 1-11) - MERIDA. Overnigh MERIDA.

OBJECTIVES AND PROBLEMS OF THE DAYS EXCURSION

This excursion means to show in a continuous way the similarities and contrasts between the different stratigraphic sections, magmatism and deformation of rocks on both sides of the Pedroches Batholith, traditionnally considered as limit between the Central-Iberian and Ossa-Morena Zones of LOTZE (1945).

Between the "Pedroches" limit and the newly proposed limit (Badajoz-Cordoba Line) spreads out a strip 50-60 km wide of hybrid character, supposed by some authors to be an extension of the Central Iberian Zone (although we reject such attribution), that will be visited in the 2nd day of excursion. The conclusions of our studies in it are as follow:

1.- The area under consideration (between Pedroches and the Badajoz-Cordoba Axis) has a "Ossa-Morena" type succession from the Precambrian to the middle Cambrian which is different from the "Central Iberian" type.

2.- The upper and top middle Cambrian seem to present comparable successions on both sides of Pedroches, with a persistent stratigraphic gap and erosional emersion episode.

3.- In the upper Cambrian and lower Ordovician, the evolution of the strip is more and more different from the Ossa-Morena Zone, progressively approaching that of the Central Iberian Zone. First, longitudinal furrows develop with siliciclastic sediments ("Cambro-Ordovician"), and then, the intervening highs form elongated basins filled up with proximal sediments derived from acid vulcanism related to the block-faulting ("Basal Ordovician").

4.- From the lower Ordovician up to the lower Carboniferous, the sequences in the intermediate Area are of Central Iberian type, with migration of the open sea from SE to E or NE.

5.- In the Southern border of the Pedroches Batholith, a strongly subsiding basin seems to start from the Cambro-Ordovician, with accumulation of abnormal thicknesses in the thousands of meters of predominantly lutitic Paleozoic sediments.

6.- After all these considerations we suggest the existence during the upper Cambrian, of an important tectonic accident connecting Ossa-Morena (that presented up to then n Northafrican or anti-atlasian affinities) with the Central Iberian Zone (always with West-european affinities). From then on, the intermediate Area shows Central Iberian Successions, although the tectonic and magmatic evolution are still of "mixed" character.

7.- From the lower Ordovician, a true paleogegraphic divide is set up in the core of Ossa-Morena,

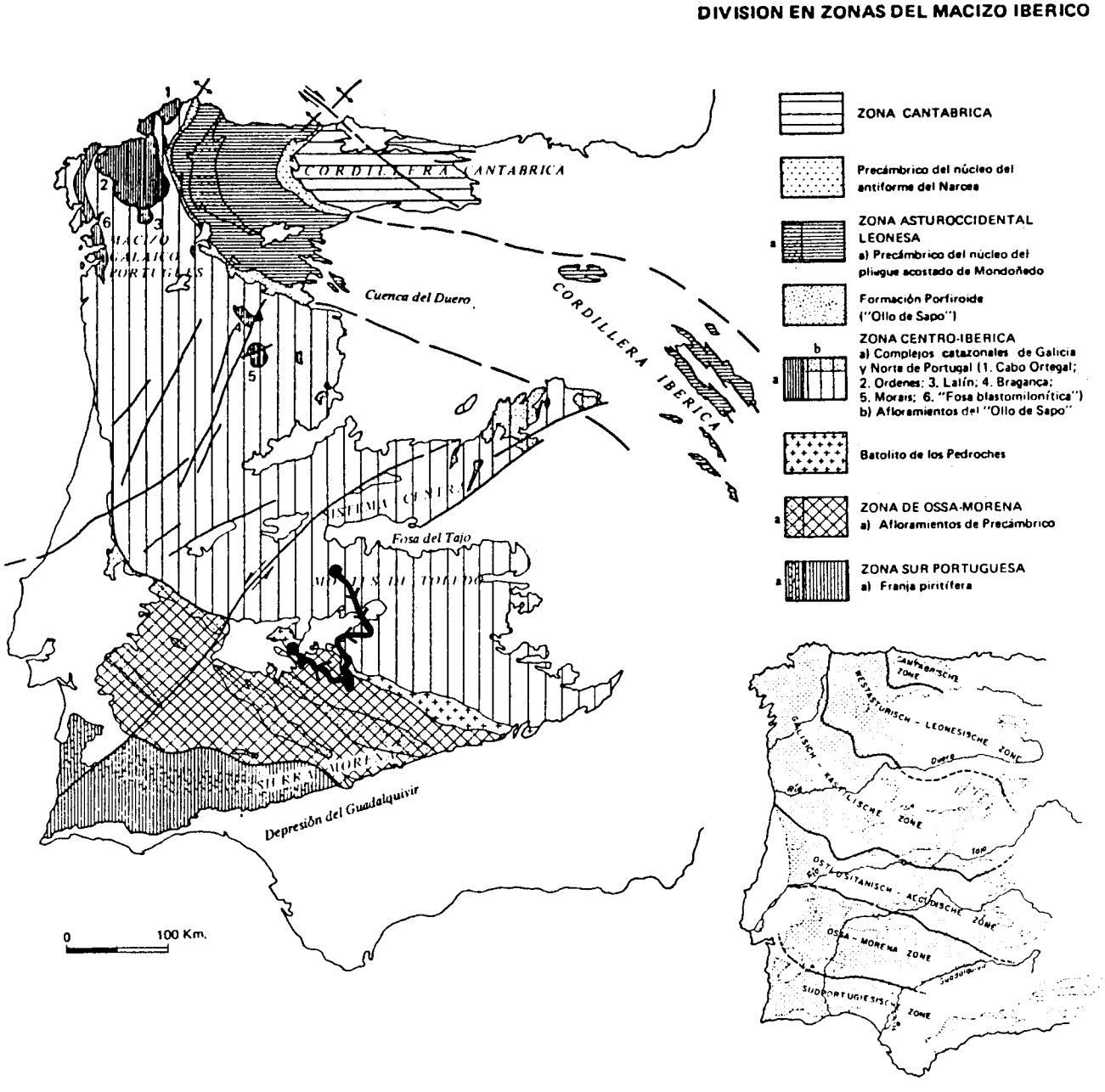

DIVISION EN ZONAS DEL MACIZO IBERICO
ZONA CANTABRICA
Precámbrico del núcleo del antiforme del Narcea
ZONA ASTUROCCIDENTAL LEONESA
a) Precámbrico del núcleo del pliegue acostado de Mondoñedo
Formación Porfiroide ("Ollo de Sapo")
ZONA CENTRO-IBERICA
a) Complejos catazonales de Galicia y Norte de Portugal (1. Cabo Ortegal; 2. Ordenes; 3. Lalín; 4. Braganca; 5. Morais; 6. "Fosa blastomilonítica")
b) Afloramientos del "Ollo de Sapo"
Batolito de los Pedroches
ZONA DE OSSA-MORENA
a) Afloramientos de Precámbrico
ZONA SUR PORTUGUESA
a) Franja piritífera
CORDILLERA CANTABRICA
Cuenca del Duero
CORDILLERA IBERICA
Fosa del Tajo
Depresión del Guadalquivir
0
100 Km.

Fig. 6

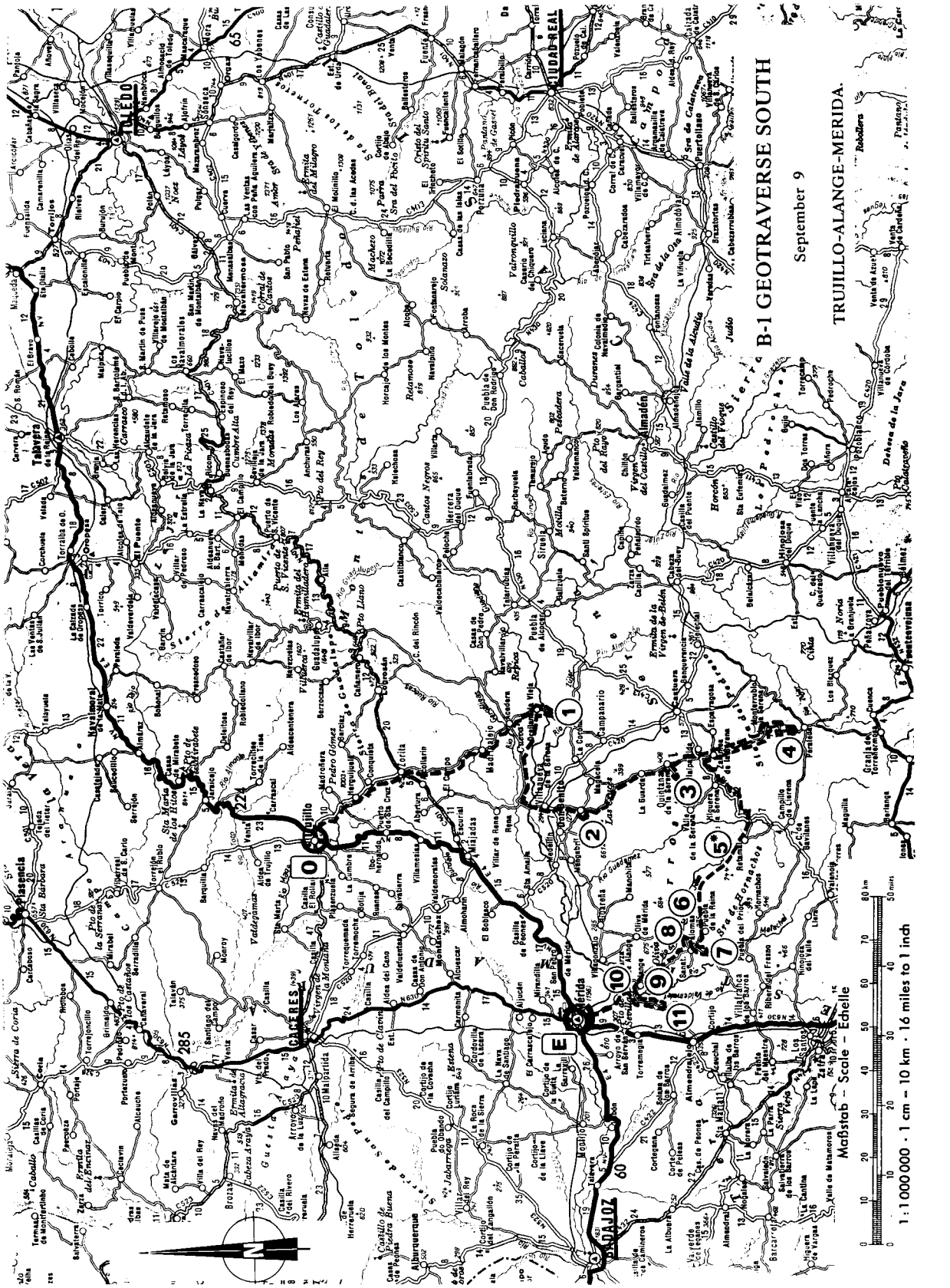


Fig. 7.- Itinerary and field stops of excursion day 2 from Trujillo to Merida

with different meaning in time, that produced quite different Paleozoic sequences in the Ne and SW ends. Nevertheless, this fact does not question the "Pedroches" line and its possible meaning.

8.- The Complex Pedroches Batholith is not a natural boundary to Ossa-Morena, although its late intrusion took advantage of an ancient crustal weakness zone, with mobility along the whole Paleozoic.

GEOLOGICAL SCHEME OF THE EXCURSION

Three different domains will be visited this day:

A) From Trujillo to Villanueva near STOP 2-2 (La Haba), with only one stop since it belongs to the area visited in day 1. This Southern sector of the Central Iberian Zone differs from the Middle part seen day 1 in :

- a different folding style
- more abundant hercynian plutonism
- absence (possibly primary) of transitional sequences from uppermost Precambrian to lower Cambrian (similar to the "Pusa" shales)
- absence (possibly primary) of known lower Cambrian deposits.

B) From Villanueva (Vegas Altas Batholith) to South of Zalamea (STOPS 2-2, 2-3, and part of the traject to STOP 2-4). The Vegas Altas Batholith is considered here as the limit formerly established in the Pedroches Batholith, although no accurate location can be set up, since there are no outcrops of Precambrian rocks nearby. The bounding plutonic rocks will be visited. STOPS 2-2,2-3,and 2-8 will show increasingly older Hercynian plutonic rocks Southwards. In STOP 2-2 the Vegas Altas Pluton would be a typical intrusive of the Northern Central Iberian Zone, while the Pedroches Batholith visited on STOP 2-3 would be the Northernmost Ossa-Morena Type, and at STOP 2-8, the Palomas Pluton is an earlier intrusive.

C) From South of Zalamea to the end of the journey, the intermediate area between Central Iberia and Ossa-Morena will be visited, trying to show the contrast between the different Precambrian successions (STOPS 2-4a,2-5*,2-7,and 2-11), as well as typical post-lower Cambrian successions from the intermediate area (STOPS 2-4b,2-6,2-9*,and 2-10) stressing their differences with the Central Iberian equivalents.

STOP 2-1

Road from Orellana to Castuera (C-413), 3 km SE of the Orellana Dam. Roadcut. Local aspect of the thick lower Alcudian succession in the core of the "Extremadura Ovale". It is made up of slaty fine-grained graywackes with disperse polygenic pebbles schists, pegmatites, amphibolites, deformed granites, quartz, graywackes, quartzites, blac chert, etc up to 10 cm cm in size indicative of the existence of a

pre-lower Alcudian metamorphism and plutonism. Turbiditic, molassic and glacial processes have been invoked to interpret the origin of this sequence.

STOP 2-2

La Haba Cemetery, 500 m North of the village on the Villanueva Road. Short walk towards the village along the Arroyo del Campo (Campo Creek) from an abandonned quarry.

Northern edge of the "Vegas Altas Pluton", cropping out for some 40 km in an E-W direction with a mean width of 6 km. It is a late Hercynian granodiorite intruding from upper Precambrian to possibly upper Devonian rocks. The radiometric age is 305±10 m.y. (K/Ar, PENHA & ARRIBAS 1974). Porphyritic adamellites and leucogranites predominate to the West near the intrusion core. At the intrusions edge microporphyritic and porphyritic granodiorites are exposed. A low to medium grade metamorphic aureole is superposed to a low grade regional metamorphism, with appearance of cordierite, chiastolite, biotite, and muscovite in the hornfelses. Associated are 15 km to the ESE, vein deposits of tungsten, with scheelite, pyrite, aresnopyrite, and chalcopyrite. In the metamorphic aureole, 10 km towards the South are supergenic deposits of radioactive minerals (pitcblende, coffinite, basettite, phosphorouranilite, autunite, and torbernite, with pyrite, marcasite, melnikovite, chalcopyrite, chalcocite, covellite, ilmenite, magnetite, phosphorite, and malachite as accesories).

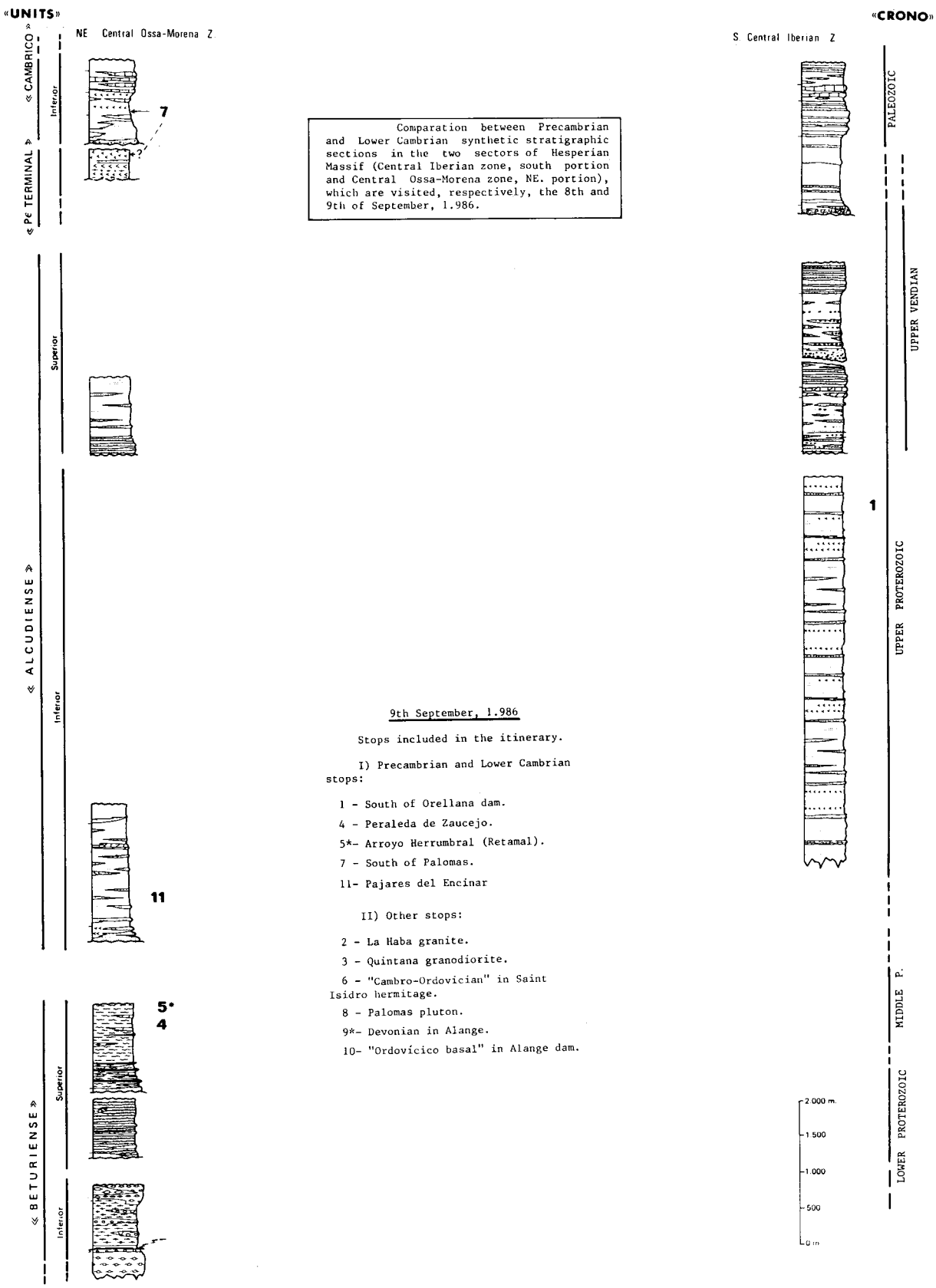
The microporphyritic granite has an allotriomorphic equigranular fine-grained matrix with quartz, albite, K feldspar, brown-red biotite and poiquilitic muscovite. Plagioclase and K feldspar phenocrysts are seen. Accesories are apatite, opaques, tourmaline, and zircon.

The porphyritic megacrystal granite shows a coarse-grained hypidiomorphic texture with K feldspar megacrystals up to 12 cm long, not with preferred orientation, with biotite and muscovite, and cordierite (in prisms up to 4 mm long), zircon, apatite, and opaques. Microgranular xenoliths are occasionally seen.

STOP 2-3

Western edge of Quintana on the Valle de la Serena road (alternative stop at a roadcut at Hojovejo, 4 km ahead}, small quarry. WnW edge of the Pedroches Batholith, which extends towards the Southeast for more than 200 km with 20 km mean width. The increasingly more detailed study shows that it is an magmatic complex made up of various diachronic intrusions of different composition and tectonic significance, and ages ranging from lower Carboniferous to Permian. Our investigations suggest that the strip presently occupied by the Pedroches plutonic complex was a subsiding furrow from late Cambrian onwards (thicker deposits of more distal character than in the flanks), after the approximation of Ossa-Morena and the Central Iberian Zone.

Granitic rocks of the Pedroches Batholith have yielded different ages:the Cabezas Granodiorite (West of Quintana was dated as 342±17 m.y. (K/Ar, BELLON et al 1979),



Comparation between Precambrian and Lower Cambrian synthetic stratigraphic sections in the two sectors of Hesperian Massif (Central Iberian zone, south portion and Central Ossa-Morena zone, NE. portion), which are visited, respectively, the 8th and 9th of September, 1.986.

9th September, 1.986

Stops included in the itinerary.

I) Precambrian and Lower Cambrian stops:

1 - South of Orellana dam.

4 - Peraleda de Zaucejo.

5*- Arroyo Herrumbral (Retamal).

7 - South of Palomas.

11- Pajares del Encinar

II) Other stops:

2 - La Haba granite.

3 - Quintana granodiorite.

6 - "Cambro-Ordovician" in Saint Isidro hermitage.

8 - Palomas pluton.

9*- Devonian in Alange.

10- "Ordovícico basal" in Alange dam.

Fig. 8.- Synthetic stratigraphic sections with location of field stops of excursion day 2

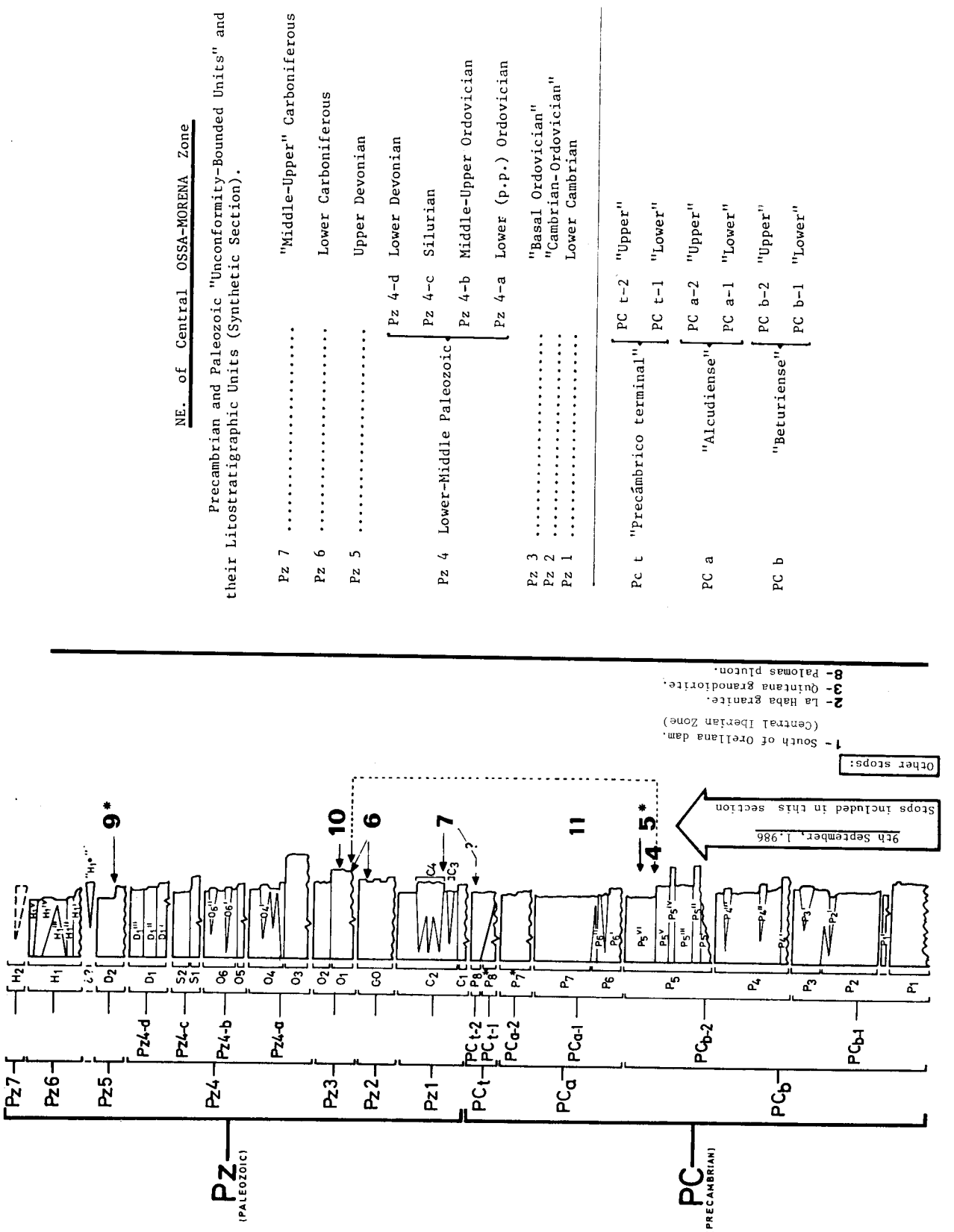


Fig. 9.- Synthetic stratigraphic sections with location of field stops of excursion day 2 (northeastern Ossa-Morena Zone)

and the Quintana Granodiorite (near this stop), 295±15 m.y. (K/Ar,BELLON et al 1979). The "La Serena" Pluton, unlike the "Vegas Altas" is emplaced parallel to the Hercynian structures, its roof is almost flat, and is affected by fractures absent in the former. It also is predominantly granodioritic, with associated charnockitic tonalites and is free of tin and radioactive minerals, with on the other hand, abundant associated sulphides.

STOP 2-4
Bridge on the Arroyo de la Mina, near km 22 of the Zalamea-Peraleda road, 2 km before Peraleda. Outcrop upcreek and roadcut 300 m farther towards Peraleda, near an isolated house. In these two outcrops, the Precambrian rocks of the intermediate area, and the "basal Ordovician" unconformable on them are visited.

2-4a.- The Precambrian rocks are made up of at least 300-400 m of quartz schists, with superposed folding and crenulation. Old chloritised garnet relics are occasionally seen, as possible remnants of an older metamorphic event. Muscovites in black quartzites within this antiform, have been dated as 550±10 m.y. ($^{40}Ar/^{39}Ar$, BLATRIX & BURG 1981), supporting then the possibility of a Cadomian metamorphism. These quartz schists are composed of several quartz generations, muscovite, chlorite, plagioclase and occasional biotite, presenting interbedded "banded quartzites", either white or graphite-rich. This would be a typical Ossa-Morena Precambrian succession, being compared to the P_5 Unit of the upper "Beturian" (middle Proterozoic?) of Ossa-Morena.

2-4b.- The basal part of the "basal Ordovician" conglomerate, crops out downcreek and starts with altered and rubeified Precambrian basement already deformed and metamorphosed, even with preexisting quartz rods. Towards the top, the sequence becomes richer in volcanic components, with disperse conglomerate lenses. The matrix is made up of volcanic quartz, sericite, chert, detrital biotite and perthitic microcline, with pebbles of porphyry, fine-grained ignimbrites, tuffs and rhyolitic to dacitic subvolcanic rocks. There are at least 700 of sequence before reaching the first quartzitic strata. These "basal Ordovician sequences" fillup tectonic basins with Hercynian directions, a few km wide and more than 200 km long.

STOP 2-5* (OPTIONAL)
2 km NNW of Retamal, on the Puebla de la Reina road, near the curve and bridge of Arroyo Herrumbral (km.31). A small outcrop in the core of the Retamal anticline.

They are microfolded slates supposedly unconformable, of Precambrian age, and compared to the "upper Beturian" (probably the upper part of unit P_5

STOP 2-6
4 km ESE of Puebla de la Reina. 600 m walk along the road towards Puebla, from the Los Meregiles Cortijo (farm) entrance to the Ermita (Chapel) de San Isidro. Uncommon coexistence of the two successions "basal Ordovician" and

"Cambro-Ordovician" with an apparent low angle unconformity. The sequence is seen from top to bottom, with conglomerates and microconglomerates of the "basal Ordovician" first, comparable to the Peraleda succession (STOP 2-4b). and then, 250-300 m of Cambro-Ordovician sequence, in turn unconformable on the "Puebla de la Reina" Group (STOP 2-7). The Cambro-Ordovician rocks are alternating quartzites and slates with laterally persistent strata and occasional tidal channels, depsoited in a proximal, wide shallow plattform.

These two sequences are usually found as alternating bands of Hercynian direction, several km wide.

STOP 2-7

1.2 km South of Palomas on the Palomas-Villafranca road. Roadcut 100 m long, exposing a section in the upper third of the "Puebla de la Reina Group", with predominant metavulcanites and metavolcanic fine grained sediments as strongly deformed low grade green schists of andesitic composition. The matrix usually bears relics of flow textures with abundant amphibole and plagioclase microliths, and secondary chlorite and epidote. The interbedded limestones are up to 2 m thick and laterally persistent for hundreds of meters. Some of them seem to be segregations, but other look sedimentary. Neither fossil remains nor sedimentary structures have been found in them.

STOP 2-8

0.5 km North of Palomas. Roadcut on the Oliva de Merida Road. Outcrop of the Palomas Pluton intrusive in the core of the Palomas-Puebla de la Reina Antiform. This is an elongated body, 35 km^2 wide, and intrusive into a schist and graywacke complex compared to the lower Alcudian, although the metamorphic aureole also affects devonian strata. It is bound to the Northeast by fractures and cataclastic deformation. The emplacement is considered as Hercynian but older than the "Pedroches" and "Vegas Altas" plutons, which would suggest a time migration of magmatism from SW to NE, with accompanying decrease of basicity. In the stop we will see the internal border facies, with predominant medium-grained, holocrystalline amphibole-bearing quartz diorites. There are also diorites and gabbros in the external zones.

STOP 2-9* (OPTIONAL)

Southern edge of the Alange village in a nearby quarry.Lower part of the upper Devonian sequence.

This is an example of the "Meso-Devonian gap" (PUSCHMANN 1967). The upper Devonian rests here unconformably on top of "basal Ordovician" to lower Devonian successions. The gap extension suggests the unconformity progression from East to West. There is also an internal discontinuity in the upper Devonian, with the upper part directly overlying in times the lower Paleozoic subtratum. There has also been detected an anomalous thin succession between the Ordovician quartzites ("armorican quartzite"), and the lower Devonian succession, whith also internal unconformities, that suggest

the existence of a "progressive unconformity" reflecting the basin instability from the lower Ordovician in this area.

The upper Ordovician sequence rests on top of Arenigian to Emsian sediments, and is made up of 15-35 m of brown burrowed sandstones and siltstones of possible infratidal plattform origin, followed by a transgressive unit of 30-70 m of black shales with sandstone nodules. Condensed sedimentation is indicated by the brachyopods, bivalves, cefphalopods, trilobites, and tentaculites found by E.MAREZ & J.MARTIN SANCHEZ, corresponding to ages from lower Frasnian to middle Famennian. On top are 15-35 m of quartzites laterally passing into mature conglomerates with a regional basal discontinuity, followed by silty shales that could be of upper Famennian or Carboniferous age.

The Alange Fault belongs to a regional set of direction N 40 dipping 20 to the SW, with a sinistral displacement of 3 km. It is probably related to the faults of the Southern boundary of the Central Spanish System. They are presently active and associated to historic earthquakes, as well as to thermal springs (Alange Roman Balneary, 28 C).

STOP 2-10

Junction of the Alange-Merida road with the new Almendralejo road, 200 m North of the Alange Dam (under construction). Roadcut along the latter."basal Ordovician sequence".

50 m of this 600 m thick sequence are exposed along the new roadcut. This sequence unconformably rests on top of a succession of schists and lenticular limestones recently dated as of lower Cambrian age. The upper Devonian conglomerates unconformably lie on the basal Ordovician, the Armorican quartzite having been eroded away. The succession is of inter- and sub-tidal origin, with low energy bars and channels, oblique laminations and isolated hummocky structures. Enigmatic alternating rubeified and non-altered beds are seen. Coarse- to medium-grained arkoses predominate, with purple finer-grained strata in between.

STOP 2-11

Deviation 200 m West of the Alange-Almendralejo road, 5 km from the junction with the Alange-Merida road. Pajares del Encinar houses. Outcrops near the houses.

A monotonous and thick schist · and graywacke succession of low metamorphic grade cropping out in the Hercynian Palomas-Puebla de la Reina Antiform, is considered as the equivalent of the lower Alcudian within the Ossa-Morena Zone.