Standard database entry of sequence stratigraphic units in AGSO

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Last issue comments were sought, particularly from industry, on AGSO's preliminary scheme for entering sequence stratigraphic units into its databases. Consequently, there were changes and the scheme AGSO follows is outlined below.

To address the urgent problem of entering sequence stratigraphic units into AGSO's databases, the following guidelines for standardised database entry of these units have been drawn up. These focus on those aspects that are the particular immediate concern of our databases, namely the definition and naming of these units. It does not deal with other aspects of sequence units such as Vail-Exxon v. Galloway types of units, or the basis on which units are ranked in hierarchies. The aim is to fulfil immediate needs, and to be able to enter those units already published or about to be published.

In the longer term, moves are underway to reach consensus on a national scheme for standards in the definition and naming of units.[1] If this produces a different scheme, the existing units in the databases can be linked to the new conventions.

Principles

The scheme is based on the following principles:

1. All sequence stratigraphic units are to be formally defined in a way similar to lithostratigraphic units, but with variations that are peculiar to sequences—for example: representative or type localities for sequence boundaries that can include outcrops, seismic line locations, and/or well intervals; biostratigraphic constraints; and methodology.
2. The basal sequence boundary is to be used as the defining parameter for sequence units (not type sections, lithology, etc.).
3. Names for sequence units must be unique and distinguishable from lithostratigraphic units.
4. The term sequence, supersequence, megasequence or subsequence must always be attached to the name of a sequence unit.
5. Names of sequences, supersequences and megasequences must be proper names, not alphanumeric codes or part alphanumeric.
6. Preferably invent appropriate names that do not contravene the other rules.
7. Using an abbreviation of the proper part of associated lithostratigraphic names is permitted. For example, a sequence that contains mainly Riversleigh Formation sediments can be called the River Sequence. However, a Mt Langsborough or Langsborough Creek Formation cannot be abbreviated to Langsborough Sequence. Langs Sequence or Borough Sequence would be acceptable in this case.
8. The use of geographic names, including well names, is discouraged because geographic names are required for lithostratigraphic units. Already there is an acute shortage of geographic names in some areas. If sequence units compete with lithostratigraphic units for the available geographic names, the situation will be exacerbated.
9. Avoid names that are age specific (e.g. *M. australis* Sequence, Jurassic 2 Sequence, Santonian Sequence).
10. Use of a digital hierarchy for subsequences and subordinate units is permitted (e.g. Dingo 1.2.3).
11. Use the sequence name or an abbreviation to identify the basal sequence boundary.
12. The parent unit of a sequence unit must be stored in the database, if a parent unit exists. (A parent unit is the next one up in the rank hierarchy to which the unit belongs; e.g. a supersequence is the parent unit of a sequence.)
13. A standard abbreviation, unique to the basin or province, must be recorded in the database for use when a name is too long for such purposes as maps and sections.

Hypothetical example

Name and rank:
White Gull Sequence.
Derivation (optional):
A bird common in the region.
Synonymy (if any): Upper part of Vindaloo Sequence of Jones (1985).
Distribution: Wildcat Basin, except for the north-east side where it has been eroded away.
Lower sequence boundary:
Type locality: Depth of 1532 metres in the Whitmore 1 well (lat 11° 30'S, long 140° 30'E), which corresponds to SP551, TWT 498 milliseconds in seismic section AZCO 1996–3.
Identifying features: 8° dip discordance on dipmeter log, strong spike on gamma-ray log, stratal termination surface in seismic section AZCO 1996–3.
Adjacent lithologies at the type locality: Limestone below the boundary, mudstone above.
Lithostratigraphic units at the type locality: Johns Limestone below, Bintang Formation above.
Underlying sequence unit at the type locality: Sea Hawk Sequence.
Age of rock below: Valanginian, E. torynum Zone.
Age of rock above: Valanginian, S. areolata Zone.
Regional aspects: Angular discordance decreases towards the centre of the basin.
Upper sequence boundaries: In the Whitmore 1 well, the unit extends upwards to the sequence boundary below the Pelican Sequence. This occurs at a depth of 1102 metres (still in the *S. areolata* Zone), which corresponds to SP551, TWT 365 milliseconds in seismic section AZCO 1996–3. However 25 kilometres to the east, the unit is overlapped by the Shearwater Sequence.
Sequence regional aspects: Subaerially deposited, sandstone-dominated succession along the eastern basin margin interfingers with paralic mudstone and sandstone westwards, and passes further west into deep offshore mudstone-dominated rocks. Sequence thickens towards the palaeo-shelf margin, but thins again in the deeper water facies.
Constituent units: Composed of three fourth-order units, the White Gull 1 Subsequence, White Gull 2 Subsequence, and White Gull 3 Subsequence.
Parent unit: Frigate Bird Supersequence.

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most abundant high-level textures in the Orange Rock vein system occur near the northern extremity. These vein textures occur in an approximately 50-metre-long, locally highly gossanous interval within a 345° trending segment just to the north of a jog from a 015° trending segment (figure 4).

Textures present in this gossanous interval include breccia, coarse bladed quartz psuedomorphs, and bladed gossan. The breccias contain silicified granodiorite clasts set within a gossanous matrix. The most unusual texture present in this zone is Fe-oxide pseudomorphs after a bladed mineral that has been folded (figure 3g). However, the lack of coherence within the folds and the lack of any other structural overprint suggest that the folds are not tectonic. Where the vein jogs to the south of this interval, the vein textures revert to the chalcedonic breccias characteristic of the vein system as a whole. This relationship implies that changes in vein trend have an important control on the development of epithermal textures in the Orange Rock vein system.

Bladed pseudomorphs of quartz are also present one kilometre to the south of the gossanous interval where the vein system bifurcates into a 350° trending main vein and a 330° trending branch. Chalcedonic quartz with disseminated pyrite is also locally present along the branch.

Veins in the Opaline Well Granite (575400 mE, 7679200 mN)

The 2765 million-year-old[6] Opaline Well Granite is cut by a series of 0.2–3 metre quartz veins that trend north-west to north-north-west (320–345°) and have strike lengths up to several hundred metres. Although evidence of sulphide minerals (e.g. gossanous patches) is lacking, these veins typically have well-developed epithermal textures dominated by bladed pseudomorphs of quartz (figure 3h), with lesser, weakly banded chalcedonic quartz. An unusual characteristic of these bladed textures is that locally the blades are composed of fluorite and not quartz. In outcrop the fluorite weathers recessively, leaving residual silica ridges (figure 5a). In thin section, the selvedges to some of the weakly banded chalcedonic veins are comprised of potassium feldspar (figure 5b). Marshall also reports the presence of epithermal textures in these veins, and notes the presence of colloform and crustiform textures.[2]

Sams Ridge deposit (590300 mE, 7707100 mN)

One of the more interesting prospects described by Marshall, the Sams Ridge deposit, is hosted by high-Mg basalt of the Louden Volcanics.[2] A brief visit was made to the Sams Ridge prospect at the location indicated by Smithies.[3] This location is 2.3 kilometres north of the Sams Ridge prospect as identified by Marshall.[2]

The site visited is characterised mainly by grey-white chalcedonic quartz with minor gossanous zones and minor brecciated zones. Locally malachite and disseminated pyrite are present. The veins are generally narrow (<1 m) and strike due north. Marshall's Sams Ridge prospect (590100 mN, 7704700 mN) consists of a north-trending 150-metre-wide zone of quartz veining and alteration along the same quartz vein system as the deposit visited by the authors. Marshall reports chalcedonic quartz, colloform banding, crack-seal textures and bladed pseudomorphs of quartz.[2] Gossanous zones, some of which contain oxide Cu minerals, occur along selvedges of some of the chalcedonic veins.

Quartz Hill vein (578700 mE, 7708000mN)

The authors also visited a north-trending chalcedonic vein near Quartz Hill Well just to the north of the Sholl Shear Zone. This occurrence is characterised by a brecciated quartz vein up to 30 metres in width and three kilometres long. Other than the extensive brecciation, no epithermal textures were observed.

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References:

Jones WH. 1985. A sequence framework for the Cretaceous of the Wildcat Basin. Drill Here Journal; 63:119–137.

Re-naming sequences

The naming of sequences in AGSO and elsewhere has been based on a number of methods in the past—most of which are inappropriate to the standards set out here. Names typically are not unique and are commonly based on alphanumeric codes or age-specific names. Use of the geographic parts of formally defined lithostratigraphic names is also widespread, even though the units often are not identical. Ideally, only where there is an exact vertical correspondence between a sequence stratigraphic unit and a lithostratigraphic unit should the geographic name also be adopted.

An example of how current usage *might* be revised is set out below, using the AGSO guidelines. Alongside the published version is a possible revised scheme, based on carriage names.

Published scheme	Possible revised scheme
BB12	Chariot Sequence
BB12C	Chariot 3 Subsequence
BB12B	Chariot 2 Subsequence
BB12A	Chariot 1 Subsequence
BB11	Coach Sequence
BB10	Phaeton Sequence
BB9	Brougham Sequence
BB8	Wagon Sequence
BB7	Rickshaw Sequence

References

1. Brakel AT. 1999. Avoiding stratigraphic confusion in exploration: The need for standards in sequence stratigraphy. APPEA Journal; 39(1):485–493.
2. Brakel AT & Passlow V. 1999. Preliminary AGSO scheme for standard database entry of sequence stratigraphic units. AGSO Research Newsletter, Nov; 31:20–21.

Acknowledgments: This scheme was developed from the preliminary scheme[2] by a forum of AGSO staff, who are thanked for their input.

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