

Precambrian geology and the Bible: a harmony

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The Precambrian record is a rich one. This paper seeks to harmonise that record with the biblical record. We do not subscribe to macro-evolutionary palaeontology and millions of years. Nevertheless, we believe much valuable work has been done in the secular realm in mapping and describing rock sequences, and that interpretations of the relative order of events can often be useful. Thus radiometric ages referred to are not regarded as absolute but rather as relative. Correlation of the Precambrian record around the world, as with other strata, is based primarily on the superpositional order mapped in the field, as well as by radiometric dating. Key times in the early biblical record, with significant geological implications believed by the authors to relate to early (Precambrian) times, are Creation Days 1 to 4, antediluvian times and the early Noahic Flood.

The Precambrian record

The Precambrian may be divided¹ into the Archean (2,500 Ma+) and Proterozoic (542–2,500 Ma) Eons. The Proterozoic Eon may be further subdivided into the Paleoproterozoic (1,600–2,500 Ma), Mesoproterozoic (1,000–1,600 Ma) and Neoproterozoic (542–1,000 Ma) Eras (Table 1). Each subdivision of the Precambrian geologic record has its own characteristics.

Precambrian shields comprise the cores of the continents and extend under Phanerozoic cover sequences. The shields consist of Archean cratons welded together and surrounded by Proterozoic orogens (ancient mountain belts). Figure 1 is a map of the world showing areas where Precambrian rocks are exposed at the surface. The Phanerozoic represents the record during which abundant animal life appeared in the geologic record and when diverse hard-shelled animals first appeared.

The following is a brief description of the key lithologic features of the major periods in the Precambrian.

Archean

Radiometric dating² of a zircon grain from the Jack Hills area of the Yilgarn Craton, Western Australia has yielded the date of 4.4 Ga. Analysis suggested that the early Earth, instead of being a boiling ocean of magma, was cool enough to have water, continents and exhibited conditions that could have supported life. This also challenges common views of an early Earth with intense meteorite bombardment, and an origin of the Moon by a Mars-sized body impacting the Earth blasting off pieces of the infant planet into space.

Archean cratons (continental areas which have not been substantially shortened or stretched since 2.5 Ga) may have cold mantle roots³ that extend twice as deep (to about 200 km) as the lithosphere beneath younger continental crust and thermally mature ocean basins. Evidence in favour of this includes the correlation of Archean cratons with areas of high shear-wave velocities, low surface heat flow and high lithospheric flexural rigidities.

Rocks of the Archean Eon consist mainly of gneisses (highly metamorphosed volcanic and sedimentary rocks)

and granitic intrusions, along with greenstone belts (belts of mildly metamorphosed volcanic—mainly komatiite and basalt—and associated sedimentary rocks). Komatiite, a high magnesium basalt (ultramafic volcanic) formed at high temperature, is characteristic of the Archean. The Archean crust is⁴ dominated by basaltic and sodium-rich granitic rocks. Sodium-rich granites indicate a greater mantle source than later potassium-rich granites.

The minimal development of carbonates and quartz arenites⁵ implies a lack of stable shelf areas during Archean time in North America. Sedimentation in the Canadian Shield during Archean time was dominated by the resedimented (turbidite) facies association of submarine fans—greywacke, mudstone-siltstone and conglomerate. Archean sedimentary rocks consist largely of greywacke—an immature sandstone containing abundant mafic minerals like hornblende and biotite.

The Archean was⁶ the principal period for gold mineralisation. Most major lode deposits formed in the late Archean (2.7±0.2 Ga). This corresponded to the principal time of crustal thickening and stabilisation, and was associated with the formation of granulite, the anhydrous, refractory base for the crust.

For some years Precambrian stromatolites (structures that are wavy and laminated in fine-scale) have usually been interpreted as the fossilised remains of communities of cyanobacteria and single-celled algae. However, Archean stromatolite-like structures may lack evidence of the microorganisms which are supposed to have constructed them. There is also evidence of carbonate precipitation during the Precambrian which resulted in some very stromatolite-like structures.⁷ Abiotic models for the origin of Archean stromatolite-like structures have been put forward.^{8,9} The Proterozoic rock record contains abundant limestone and associated stromatolites. The appearance of widespread stromatolitic carbonates at about 2,300 Ma has been said¹⁰ to separate the Archean from the Proterozoic.

The earlier Archean (3,550+ Ma) has been inferred¹¹ to be characterised by a global ocean, vertical tectonics, high radiogenic heat flow, a hot hydrosphere, granulite facies

Table 1. Summary correlation of Precambrian geology and the Bible.

| Precambrian Subdivisions | Key Lithologies/ Sequences | Other Comments | Bible Events and Description | Some Key Verses |
|-------------------------------------|---|--|--|---|
| Neoproterozoic Era | Ediacaran fauna above Mixtites | Canyons. Mass flow deposits at all latitudes. Global marine transgression. Rifting, fracturing. | Early Noahic Flood: Fountains active, torrential rain. | Genesis 7, 8 Proverbs 3:20, 2 Peter 3:6 |
| Later Mesoproterozoic Era | Possibly deltaic and river deposits in rift sutures. | Preservation of such soft sediments in the Noahic Flood would require downfaulting and burial. | Antediluvian: Rivers. Pure gold in land of Havilah. High mountains. | Genesis 2:10–11 Genesis 7:19 |
| Earlier Mesoproterozoic Era | Basalt, gabbro- anorthosite, red bed sediments | Rifting | Day 3: Land separated from seas. | Genesis 1:9–10 |
| Latest Paleoproterozoic | | Biggest magmatic processes | Just prior to Day 3 | |
| Earliest Paleoproterozoic | Giant placer deposits. | Gold-bearing | Day 2: Waters above and below separated. | Genesis 1:6–8 |
| Archean Eon to Paleoproterozoic Era | | BIF sequences generally lie unconformably on older sequences (e.g. peneplained Archean cratons). Global ocean | | |
| Archean Eon | Granite-greenstone-gneiss. Komatiites. Shelf deposits lacking. | Archean stromatolites possibly inorganic, at sites of upwelling springs. Especially if one infers that there was no life, even cyanobacteria, before Day 3. (Genesis 1:11–12) Global ocean | Day 1: Earth without form ... void | Genesis 1:2–3 |

metamorphism and intensive volcanic activity. Gneiss fold ovals 100 to 800 km across occur. Other characteristics include high grade metamorphosed volcanics of basic and partly ultrabasic composition, mature sedimentary rocks such as quartzite and the absence of organic remains (biogenic structures).

Localities of earlier Archean sequences include¹¹ the gneiss of Kola Peninsular (Russia), Karnataka (India), Western Greenland, Canadian Shield, Itamaca Complex (Venezuela), Barberton (Swaziland) and Mt Narryer (Yilgarn Craton, Western Australia).

The later Archean (~2,800–3,550 Ma)¹¹ is characterised by a platform-geosynclinal stage; greenschist and amphibolite facies metamorphism; varied sedimentary-volcanogenic strata; ‘the first determinable organic remains’—stromatolites, oncolites; mantled gneiss domes; three successive groups of supracrustals/greenstones (ultramafic-mafic, calc-alkaline and sedimentary strata). The late Archean ending with crust so rigid that large

fractures formed allowing magma to enter (for example, the Widgiemooltha Dyke suite of Western Australia).

Localities of later Archean sequences include¹¹ Swaziland Supergroup (Africa), Abitibi Belt (Canada), Karelia and Kola Peninsular (Russia), Ukrainian Shield, Kalgoorlie and Pilbara Supergroups (Western Australia).

Greywackes were subjected to reworking by weathering processes so that mafic minerals were gradually destroyed, leaving behind more resistant quartz and feldspar in the early Proterozoic sedimentary record. It has been inferred that vast cratons with extensive passive margins had developed in the Proterozoic.¹²

Repetitious turbidites and volcanoclastics that dominate the Archean give way in the Proterozoic to a wide variety of sedimentary rock types. This variety reflects numerous sedimentary environments, some marine, some continental and some transitional environments, such as beaches, tidal flats and deltas.¹³

The change from Archean to Proterozoic tectonic regimes occurred¹⁴ between 2,700 and 2,500 Ma, and was accompanied by extensive magmatic activity.

Banded iron formations (BIFs, consisting of bands of iron oxide and chert) are concentrated in the upper Archean and Paleoproterozoic.¹⁵ Major BIFs generally lie unconformably on older sequences¹⁴ such as peneplained Archean cratons or Paleoproterozoic clastic sequences that commonly contain placer gold. In Western Australia, the Hamersley Basin lies unconformably on the Archean North Pilbara Terrane.¹⁶ Other parts of the world with significant BIFs include¹⁴ Transvaal Basin (South Africa), Marquette Lake Superior (North America), Krivoy Rog (Ukraine) and Quadrilátero Ferrífero (Brazil).

The case has been put¹⁷ for the ‘rapid’ (similar to or faster than the rate of deposition of modern pelagic sediments) rather than gradual (millions of years) origin of BIFs during a large tectono-magmatic event in the Hamersley Basin of Western Australia. A largely hydrothermal origin for mineralisation is consistent with interpretations that the biosphere contained significant oxygen at the time of mineralisation.¹⁸

Paleoproterozoic

A number of impact structures have been found in the Paleoproterozoic. The Vredefort Impact Structure in South Africa is believed¹⁹ to be the oldest (2 Ga) and largest impact structure (estimated 250–300 km diameter original crater) in the world. The Sudbury Impact Structure in Canada is similar in size (estimated 200 km diameter original crater) and age (1.85 Ga). The Shoemaker Impact Structure,²⁰ the oldest Australian impact structure to date (1.63 Ga), is located on the southern margin of the Paleoproterozoic Eeraheedy Basin, Western Australia and is approximately 30 km in diameter.

The earlier Paleoproterozoic (1,900–2,500 Ma) is characterised by¹¹ terrigenous molasse-like strata, local red beds, flyschoid terrigenous or terrigenous-carbonate strata, quartzite-slate and dolomite strata with local thick horizons of jaspilite, quartzite, carbonates with stromatolites and jaspilite. At the Archean boundary there are volcanics, terrigenous strata including three horizons of ‘tillite’, and gold-uranium conglomerates (Witwatersrand).

Localities with earlier Paleoproterozoic sequences include¹¹ the Karelian Supergroup, Kola Peninsular (Russia), Krivoy Rog (Ukraine), Southeast Hindustan (India), Lake Huron, Labrador (Canadian Shield), Wyoming (USA), Minas Gerais (Brazil), South Africa, Kimberley (Western Australia) and Pine Creek (northern Australia).

The latest Paleoproterozoic (1,600–1,900 Ma) had¹¹ the biggest magmatic processes (and associated fractures in every continent) in Earth history. It is characterised by magmatic rocks with a wide scattering of radiometric dates. Igneous rocks include basalt, acid volcanics and comagmatic subvolcanic and hypabyssal intrusions of granite and syenite. Its continental (essentially volcanogenic and clastic) strata lack organic remains.

Mesoproterozoic

The Mesoproterozoic was²¹ the Era of the formation of the first identifiable supercontinent, Rodinia. A case has been put for a configuration of a Rodinia supercontinent during the Proterozoic that puts the southwest margin of North America adjacent to the eastern margin of Australia.²²

In the mid-Proterozoic (1.7 to 1.2 Ga)²³ major abortive rifting gave rise to anorogenic sodic anorthosites and rapakivi granites. The Mesoproterozoic Midcontinent rift system in North America is described²⁴ as a classic example of an aborted continental rift or intracratonic rift. Felsic volcanism, subsidence and sedimentation followed the eruption of voluminous flood basalts.

Most of the world’s major base metal ore deposits of Proterozoic age²⁵ can be placed within a lithotectonic setting framed by rifting events. Mid-Proterozoic giant lead and zinc deposits (such as Mt Isa, Hilton, H.Y.C. and Broken Hill in Australia, and Sullivan in Canada) were formed by episodic dewatering of sedimentary basins.²⁶

The Mesoproterozoic Era was the high point of the stromatolites,²¹ huge mushroom or tree-like colonies of bacteria. Multicelled algae first appeared in the Mesoproterozoic.²⁷

The Mesoproterozoic Era is characterised¹¹ by various platform and geosynclinal strata. Red beds, red terrigenous rocks, basalt flows and dolerite sills are abundant among platform strata. Sedimentary iron ores of the sheet (Urals) type are present. Phytolites occur in carbonate rocks and acritarchs in terrigenous rocks.

Locations with Mesoproterozoic to latest Paleoproterozoic sequences include¹¹ the South Urals, Baikal mountains and the Aldan Shield (Russia), northern China, Hindustan Peninsular (India), North American Cordilleras, Canadian Shield, Kimberley (Western Australia), Tanzania, southeast Zaire, Algeria, Namibia, Bangemall Basin (Western Australia), Katherine-Darwin, McArthur Basin and Mount Isa Belt (northern Australia)

Neoproterozoic

A case has been put²⁸ for a single Proterozoic supercontinent—both the polarities and positions of the Proterozoic paleopoles from the major shields conform to a single apparent polar wandering (APW) path using a unique reconstruction. Peripheral parts of this supercontinent appear to have broken up without major separation 1,100 Ma ago, and the central parts broke up at the beginning of Cambrian times with the formation of a large ocean basin between the Gondwanaland and Laurentian, Fennoscandian and Siberian Shields. Both of these episodes are characterised by widespread rifting and alkaline magmatism.

The most specific and typical feature of the Neoproterozoic below the Ediacaran (i.e. 630–1,000 Ma) is¹¹ the occurrence of ‘glaciogene’ rocks from two stratigraphic levels. The upper ‘glacial’ is usually overlain by sediments with a higher concentration of barium. The lower ‘glacial’ is commonly associated with sheet deposits of iron ores and

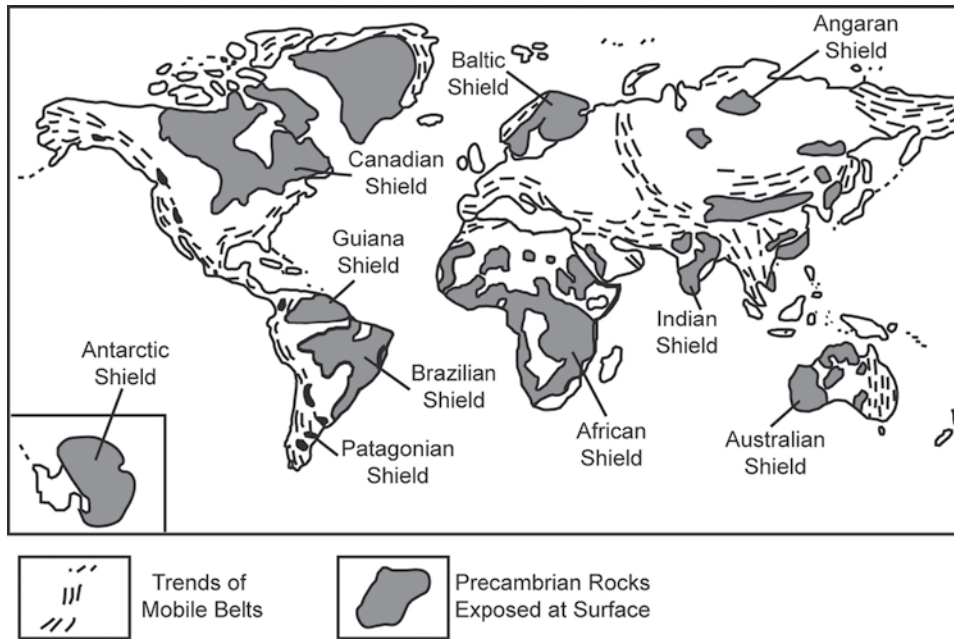


Figure 1. Map of the world showing Precambrian rocks exposed at the surface. (After Levin⁴⁶).

basic volcanics. ‘Glaciogenic’ rocks commonly have direct contact with hot climate strata enclosing redbeds, dolomite and limestone with phytolites. In addition, these ‘glacials’ have a global-scale distribution irrespective of latitude. Many newly formed geosynclines were situated on the margins of the continents. Continental rifting cut across all earlier tectonic grain, initiated the Cordilleran geosyncline, and gave birth to the EoPacific separating North America and Asia. This was contemporaneous with the Pan-African thermal convulsion.²⁹

Compared to inferred glacial formations of the Early Proterozoic, Paleozoic and Pleistocene, the supposed glacial formations of the Late Proterozoic present aberrant features³⁰ indicating a different geotectonic, tectonosedimentary, and climatic framework. They are mostly found in geosynclines where they may be very thick. They are associated with tectonic uplift of source areas including basin margins so that they rest on a variable disconformity. In addition they, paradoxically for glacials, contain interbedded warm facies (carbonate, glauconite, iron formation).

In the Neoproterozoic, ‘glacials’ have been inferred worldwide, yet they commonly occur with carbonate such as dolomite and they are interpreted to commonly have an equatorial palaeolatitude (such as in Africa, Australia and Europe). The abundance of carbonates with stromatolites and ooids and the evidence of evaporite suggests, by comparison with the present day, a relatively warm climate.³¹ An alternative explanation is that these ‘glacials’ are in fact submarine massflow deposits adjacent to active tectonic areas.³²

The Neoproterozoic below the Ediacaran Period¹¹ occurs in localities such as Zambia, Zaire, Congo, Angola, the Adelaide Supergroup and Kimberley (Australia), British

Columbia and Newfoundland (Canada), south Norway, Byelorussia and middle Ural.

Some Neoproterozoic diamictite-bearing sequences that were the products of debris flows and mass flows may represent the fallout of ballistic ejecta.³³ In the South Australian Neoproterozoic (600 Ma) the Acraman impact structure has been correlated³⁴ with the Bunyerroo ejecta horizon using palaeomagnetic data, similarity of lithologies, and U-Pb zircon ages.

In South Australia’s Neoproterozoic at or near the base of the Wonoka Formation there is a series of spectacular canyons or incised valleys, some more than 1 km deep.³⁵ It is said that the canyons formed after an interval of continental

rifting between 800–700 Ma. In eastern California in the Ediacaran there occur³⁶ deep incised valleys in the upper Johnnie Formation.

Neoproterozoic mixtites/‘glacials’ are found at a variety of locations worldwide including^{11,32} Kimberley, Central Australia and Adelaide Geosyncline (Australia), Cordilleran and Appalachian Geosynclines (North America), West Africa, Kazakhstan, China and Caledonian Geosyncline (Europe and Greenland).

The Ediacaran Period is characterised¹¹ by platform, rare geosynclinal terrigenous and/or carbonate sediments containing Ediacara fauna remains, calcareous algae, worm imprints and various phytolites. There is evidence of a large marine transgression in many parts of the world. In the Ediacaran Period the earliest fossils of multicelled life are found, including the earliest animals.³⁷

Every continent has sequences of the Ediacaran Period (542–630 Ma) of the Neoproterozoic. This includes¹¹ the Volday Group (Russia), Yudoma Group (Siberia), Beltian geosyncline and Appalachian foldbelt (North America), Morocco, Namibia, Adelaide geosyncline (South Australia) and the Amadeus Basin (central Australia).

Clustering of sedimentary phosphate deposits around the Precambrian-Cambrian boundary is³⁸ related to a global phosphogenic event. There is a general upward sequence of Neoproterozoic ‘tillites’ followed by phosphorites and then shelly fossils (the ‘Cambrian explosion’). The phosphate is associated with a worldwide marine transgression, and catastrophic ocean water mixing (deep and shallow oceanic waters) as inferred from sulfur isotopes. Phosphogenesis may have been associated with widespread volcanism and rifting.

The biblical record and its correlation

The biblical record contains a number of key events that may have left a geological signature of early times. These are described in the following sections under Day 1, Day 2, Day 3, Day 4, the antediluvian period and the early Noahic Flood.

‘In the beginning God created the heavens and the earth’ (Genesis 1:1 NIV).

This is the great first verse of the Bible proclaiming that God created the universe. This is repeated many times in the Bible (for example Psalm 121:2; Isaiah 44:24, 45:12, 66:1–2; Jeremiah 10:12, 32:17; Acts 7:49–50; Revelation 14:7).

‘... [God] made the heaven and earth and the sea, and everything in them ...’ (Acts 4:24b, 14:15b NIV).

‘And he [angel] swore by him [God] who lives for ever and ever, who created the heavens and all that is in them, the earth and all that is in it, and the sea and all that is in it ...’ (Revelation 10:6a NIV).

Again these verses proclaim that God is the great intelligent designer of the universe and all within it.

‘For this is what the LORD says—he who created the heavens, he is God; he who fashioned and made the earth, he founded it; he did not create it to be empty, but formed it to be inhabited—he says: “I am the LORD, and there is no other”’ (Isaiah 45:18 NIV).

An initial *ex nihilo* creation is followed by a period of fashioning the Earth—particularly the first few days of creation. This verse in Isaiah appears to be in harmony with the article by Devitt²—*Oldest crystal tells tale of hospitable early Earth*. God saw that it was good (Genesis 1:10b, 12b).

Accelerated radioactive decay (covering about 3,000–4,000 Ma) accompanied catastrophic geologic processes during the early part of the Creation Week³⁹ (days 1–3, avoiding radiation damage to the biology thereafter) and during the Flood (covering 600+ Ma). (Inheritance and mixing are not sufficient to explain radioisotope ratios, but accelerated decay is the dominant factor involved.) This fits the model proposed, with radioisotope ages indicating relative order and rocks being rapidly ‘aged’ during the early Creation week through the Archean-Mesoproterozoic.

Day 1

‘I was there when he set the heavens in place, when he marked out the horizon on the face of the deep’ (Proverbs 8:27 NIV).

‘You covered it with the deep as with a garment; the waters stood above the mountains’ (Psalm 104:6 NIV).

‘Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the waters’

(Genesis 1:2 NIV).

‘But they deliberately forget that long ago by God’s word the heavens existed and the earth was formed out of water and with water’ (2 Peter 3:5 NIV).

‘Worship him who made the heavens, the earth, the sea and the springs of water’ (Revelation 14:7b NIV).

On the first day the earth was still of dominantly watery aspect.⁴⁰ In fact, the earth had its first global ocean (the second and only other global ocean being during the peak of Noah’s Flood) on Days 1 and 2, before the gathering of waters and appearance of land on Day 3 (Genesis 1:9). In Genesis 1:2 the earth would have appeared from space like a relatively smooth watery ball, without obvious features or landmarks such as mountains protruding above the water. The Spirit of God moving upon the waters might imply shaking or vibrating.⁴⁰ We infer convection cells operating in the waters and in the magma below. Activity with a geological signature seems probable—there may have been submarine volcanic mountains and turbidite facies associated with submarine fans, but no shelf deposits. The initial global ocean may have resulted from outpouring of waters as catastrophic degassing of the earth’s interior took place associated with rapid radioactive decay and heating.

Day 1 is correlated with at least the early Archean—a time of global ocean, as mentioned in a previous section.

‘He set the earth on its foundations, it can never be moved’ (Psalm 104:5 NIV).

The foundations of the earth, mentioned in numerous other verses (such as Job 38:4, Psalm 102:25, Proverbs 3:19, Isaiah 51:13, Zechariah 12:1 and Hebrews 1:10), may be the mantle roots³ of Archean cratons inferred to extend twice as deep (to about 200 km) as the lithosphere beneath younger continental crust and thermally mature ocean basins.

No mention is made of life in the Bible until Day 3 (land vegetation—Genesis 1:11–12). Thus organic stromatolites are inferred to be absent until Day 3. Earlier stromatolite-like structures would thus be inorganic artifacts at sites of hydrothermal vents and upwelling springs.

Day 2

‘And God said, “Let there be an expanse between the waters to separate water from water.” So God made the expanse and separated the water under the expanse from the water above it. And it was so’ (Genesis 1:6–7 NIV).

‘... when I made the clouds its garment and wrapped it in thick darkness, ...’ (Job 38:9 NIV)

‘... when he established the clouds above and fixed securely the fountains of the deep, ...’ (Proverbs 8:28 NIV)

Clouds (largely water vapour) may have been associated with volcanic and hydrothermal activity. Active springs may have given rise to abundant abiotic stromatolite-like structures by the end of the Archean.

End Archean ‘glacials’ are inferred to be associated with great vertical movements of waters during Day 2. Likewise, the early Paleoproterozoic Witwatersrand gold-uranium conglomerates are inferred to have resulted from great vertical upheavals of Day 2. Paleoproterozoic impact structures are inferred to have formed when material ejected from the earth fell back to earth.

‘Who shut up the sea behind doors when it burst forth from the womb’ (Job 38:8 NIV)

A catastrophic pouring out of volcanics and associated banded iron formations (Archean to early Paleoproterozoic) are inferred to correlate with Day 2. The iron oxides (hematite) may have been blood-coloured as if from the womb.

A global ocean is characteristic of Days 1 and 2 as dry ground appeared on Day 3.

Day 3

‘And God said, “Let the water under the sky be gathered to one place, and let dry ground appear.” And it was so. God called the dry ground “land”, and the gathered waters he called “seas”. And God saw that it was good.’

Genesis 1:9–10 (NIV) is inferred to have formed part of the land.

‘You covered it with the deep as with a garment; the waters stood above the mountains. But at your rebuke the waters fled, at the sound of your thunder they took flight; they flowed over the mountains, they went down into the valleys, to the place you assigned for them’ (Psalm 104:6–8 NIV).

With the separation of land and seas, rift tectonics was significant during Day 3. The Mesoproterozoic Era (described previously) was a time of extensive rifting and this is inferred to correspond with Day 3. The latest Paleoproterozoic had the biggest magmatic processes¹¹ and this would have preceded the rifting that took place on Day 3.

‘When the LORD God made the earth and the heavens, no shrub of the field had yet appeared on the earth and no plant of the field had yet sprung up; the LORD God had not sent rain on the earth and there was no man to work the ground, but streams came up from the earth and watered the whole surface of the ground’ (Genesis 2:5–6 NIV).

A corollary of the above is that, by the time man was present, there was rain on the earth and vegetation.

The early Earth would have had a very different hydrological regime⁴⁰ compared with current conditions. In early times the land’s water supply would have primarily come from upwelling springs. These springs would have been the site of inorganic and later organic stromatolites. The Mesoproterozoic is said¹¹ to have been the high point of stromatolites.

Day 3 is the first mention of life on Earth. It is inferred that this correlated with times after the Archean, perhaps the later Mesoproterozoic.

Day 4

The presence of the sun and the moon implies tidal processes and tidal products. Conversely, prior to the existence of the sun and moon there would not have been tidal processes and tidal deposits. Tidal deposits may not have begun forming until the later Mesoproterozoic.

Antediluvian period

From the Bible’s silence on catastrophic events pre-Flood, as well as idyllic conditions associated with the beginning of the creation of Adam and Eve, it may be inferred that the antediluvian period was a time of relatively quiet deposition of rock sequences. Although the Fall had occurred, it may be that things had not deteriorated to parallel the state of affairs of today with its intermittent and localised volcanic, earthquake, debris flow and tsunami activity. Deltas would have formed at the mouth of rivers (Genesis 2:10–14). Since deltaic sediment could be easily eroded away in the Noahic Flood, downfaulting and burial would have been necessary for preservation of pre-Flood deltaic deposits.

The site of antediluvian rivers mentioned in Genesis 2 has been correlated⁴¹ with suture zones in a pre-drift Mesozoic configuration of the Pangaea supercontinent.

‘The name of the first [river] is the Pishon [possibly in the modern Ganges-Indus area]; it winds through the entire land of Havilah [possibly India], where there is gold. (The gold of that land is good; aromatic resin and onyx are also there.)’ (Genesis 2:11–12 NIV).

This gold would not be a telluride as this is not pure gold. The gold may have had a very low silver to gold ratio and been from an Archean greenstone belt or from Paleoproterozoic placers.

‘... they rose greatly on the earth, and all the high mountains under the entire heavens were covered’ (Genesis 7:19 NIV).

The antediluvian mountains may have occurred at the site of Proterozoic orogens which surround Archean cratons.

Early Noahic Flood

‘By water also the world of that time was deluged and destroyed’ (2 Peter 3:6 NIV).

‘... by his knowledge the deeps were divided, and the clouds let drop the dew’ (Proverbs 3:20 NIV).

‘In the six hundredth year of Noah’s life, on the seventeenth day of the second month—on that day all the springs of the great deep burst forth, and the floodgates of the heavens were opened’ (Genesis 7:11 NIV).

This verse describes a world-wide simultaneous (commencing in the same day) erupting of springs or fountains, and subsequent falling of rain. Volcanic material

would likely have accompanied these eruptions. It may be that the bulk of the water from the Noahic Flood came from depths within the earth.

‘Deeps were divided’ and ‘springs of the great deep burst forth’ imply rifting and fracturing of the earth’s crust. This may correlate with Neoproterozoic rifting of the Rodinian supercontinent. Catastrophic plate tectonics have been used for a global Noahic Flood model of earth history.⁴²

The early Noahic Flood is a time of very high energy (massive water flows springing up from within the earth, along with torrential rainfall) and rifting. Enormous torrential rain would have caused huge massflows sweeping down from landmasses into the seas. Spectacular canyons or incised valleys such as in South Australia’s Neoproterozoic may have formed at this time.

The large marine transgression previously described for the Ediacaran Period of the Neoproterozoic Era is inferred to correlate with the rising sea level stage of the Flood.

Neoproterozoic mass flow deposits (rather than being ‘glacials’) may represent the higher energy early stage of Noah’s Flood. This higher energy phase may have been when the fountains of the great deep were open. A case has been put⁴³ that the Kingston Peak Formation in California provides evidence for the catastrophic initiation of Noah’s Flood rather than glaciation. Debris flows and catastrophic coarse clastic deposits have been interpreted.

It is interesting that in South Australia the Acraman impact structure has been correlated with the Neoproterozoic Bunyeroo ejecta horizon.⁴⁴ If the Neoproterozoic represents the early stage of Noah’s Flood then such impact and ejecta sites could imply material coming to earth from perhaps Mars or material ejected from earth fountains at high velocity returning to earth. Flooding may have occurred on Mars at this time. Just as Adam’s sin affected the universe (Romans 5:22) so there may have been interplanetary consequences associated with the degeneracy of the antediluvian peoples. Man is the peak of God’s creation and God judges man’s rebellion.

Erosional, age, tectonic, sedimentary and paleontological discontinuity criteria for the Pre-Flood/Flood boundary have been described⁴⁵ for the Mojave area and Grand Canyon area.

‘The waters rose and covered the mountains to a depth of more than twenty feet. Every living thing that moved on the earth perished [was wiped away]—birds, livestock, wild animals, all the creatures that swarm over the earth, and all mankind. Everything on dry land that had the breath of life in its nostrils died’ (Genesis 7:20–22 NIV).

In the vicinity of active acidic volcanic fountains the abrasive power of jets of water with entrained sediment assisted the solution of vertebrate bones and flesh. Abrasion would have provided finer grained material which would have assisted the chemical solution process. The dissolved material may have subsequently precipitated out as massive

phosphorite deposits at localities around the Precambrian-Cambrian sequence boundary.

Conclusion

This paper aims to fill a gap in literal Bible (young-earth creationist) geological literature by providing a reasonably extensive harmony of the biblical and Precambrian records. We recognise that much useful studies have been done in the secular realm in mapping and describing rock sequences, and that interpretations of the relative order of events can often be useful. Each subdivision of the Precambrian geologic record has its own characteristics. The majority of geological activity during the Precambrian is inferred to have occurred in the first few days of Creation Week and during the initial Noahic Flood. It is concluded that global scale geological work was done in the Creation Week and not just in the Noahic Flood. It is hoped that this paper will stimulate further constructive studies and discussion on harmonising the biblical record and Precambrian geology.

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