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# Supplementary Materials for

## Ediacaran Metazoan Reefs from the Nama Group, Namibia

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### **This PDF file includes:**

Materials and Methods  
Supplementary Text  
Figs. S1 to S4  
References (30-39)

### **Materials and Methods**

#### Preferred Orientation in *Cloudina* (Fig. S4)

*Cloudina* was noted in outcrop to have an initially vertical (e.g. Fig. 1I), then sub-horizontal (e.g. Fig. 1G) growth. Orientation of sub-horizontal *Cloudina* growth was analyzed using two field photographs of bedding planes. Photographs (including Fig. S3D) were imported into ImageJ and the angle measuring tool used to measure the orientations of each of the visible tubes by assigning them an angle from horizontal, in the plane of the photograph. Only those which presented a longitudinal cross-section at the surface of the bedding plane were measured. The orientations obtained were bidirectional, i.e., with no assumption made about growth direction. In total, 81 tubes were selected for measurement from Dreidoornvlagte. The results, which include only directional data but not plunge of any of the tubes, were recorded on a half-rose diagram (Fig.S4A).

We also analyzed the orientation of in-situ *Cloudina* growth from another locality (Swartpunt, Spitskopf Formation), where *Cloudina* grew attached to thrombolites. Here a total of 63 tubes were selected for measurement (Fig S4B). These data also confirm a notable preferred orientation.

Together these data provide evidence for preferred orientation of *Cloudina* in different ecological modes, so supporting a shared mode of feeding - that of passive suspension-feeding.

### **Supplementary Text**

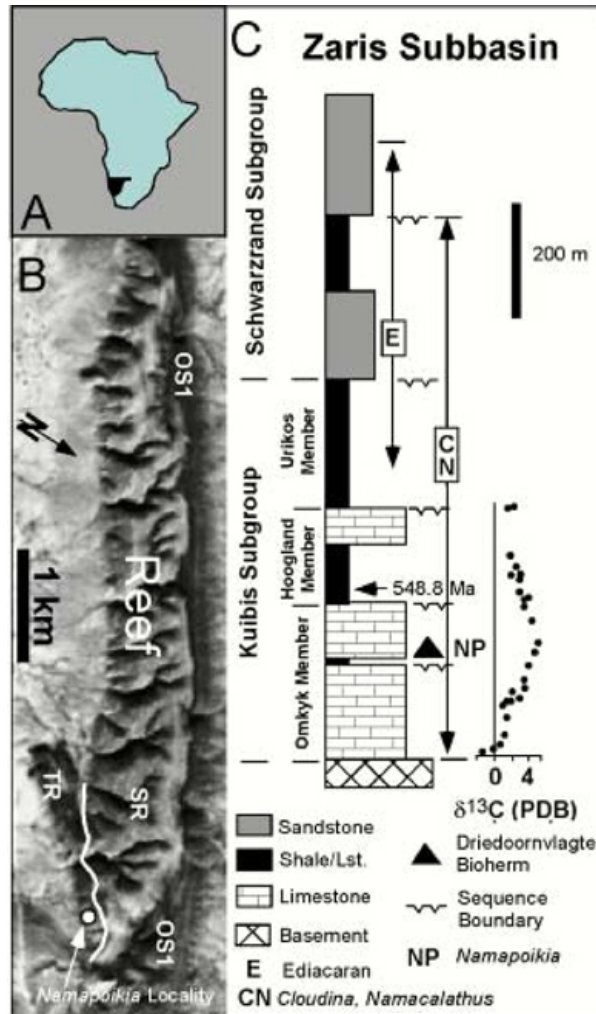
#### Geological Setting and Age

The Nama Group was deposited in a foreland basin on the Kalahari Craton that developed during convergence along the Damara and Gariep compressional belts (30-33). The Osis basement arch separated the northern Zaris and southern Witputs Sub-Basins during the deposition of the lower Nama Group (Fig. S1; 30, 34, 35). The Proterozoic Kuibis and Schwarzrand Subgroups were deposited in settings ranging from upper shoreline/tidal flats to below-wave-base lower shoreface (Figs. S1, S2; 30, 33, 34, 36).

Carbonate units in the Kuibis Subgroup are mostly contained within the lower and upper Omkyk and Hoogland members and are recognised across the northern Zaris Sub-Basin (30, 33, 34, 36). The Omkyk Members consist of 10-20 meter-scale upward-coarsening, lower and middle-to-upper shoreface cycles. The Hoogland member consists primarily of heterolithic interbeds that record transgressive-regressive depositional successions in middle shoreface settings.

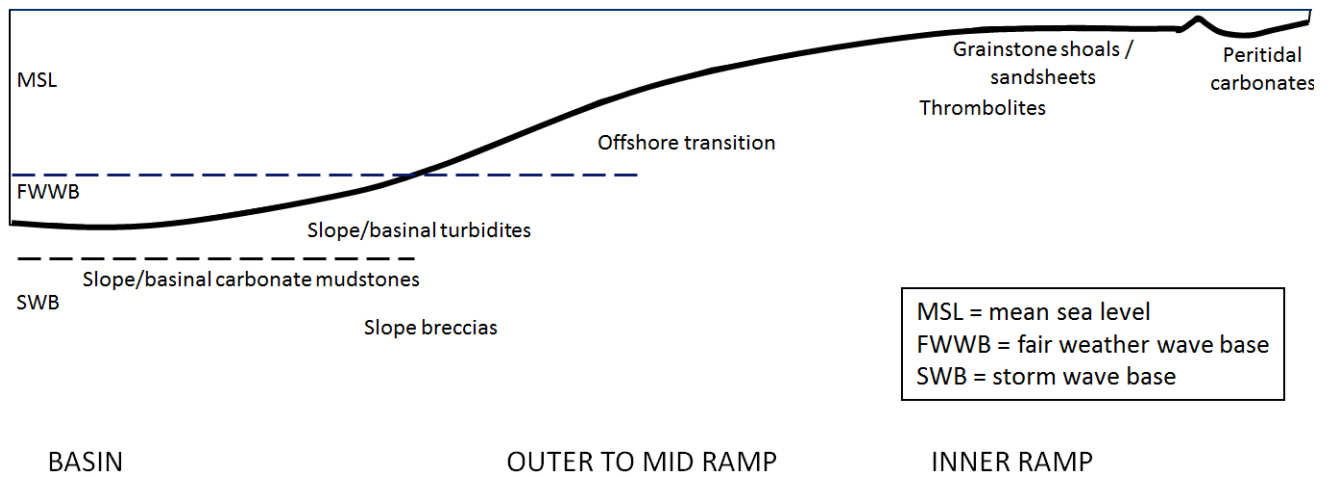
The age of the Nama Group is relatively well-constrained from the U-Pb dating of three ash beds within the group (Fig. 2A; 21, 37), including one at  $547.32 \pm 0.31$  Ma in

the Hoogland Member (Kuibis Subgroup, Zaris Sub-Basin). The Proterozoic-Cambrian boundary is represented by a regionally extensive erosional unconformity near the top of the Schwarzrand Subgroup in the southern sub-basin (22, 35, 38), which is overlain by incised-valley fill dated (U-Pb, ash bed) at  $539 \pm 1$  Ma (38). Therefore, the Nama Group section spans approximately 10 Myr and extends to within 1 Myr of the Proterozoic-Cambrian transition (34, 39).

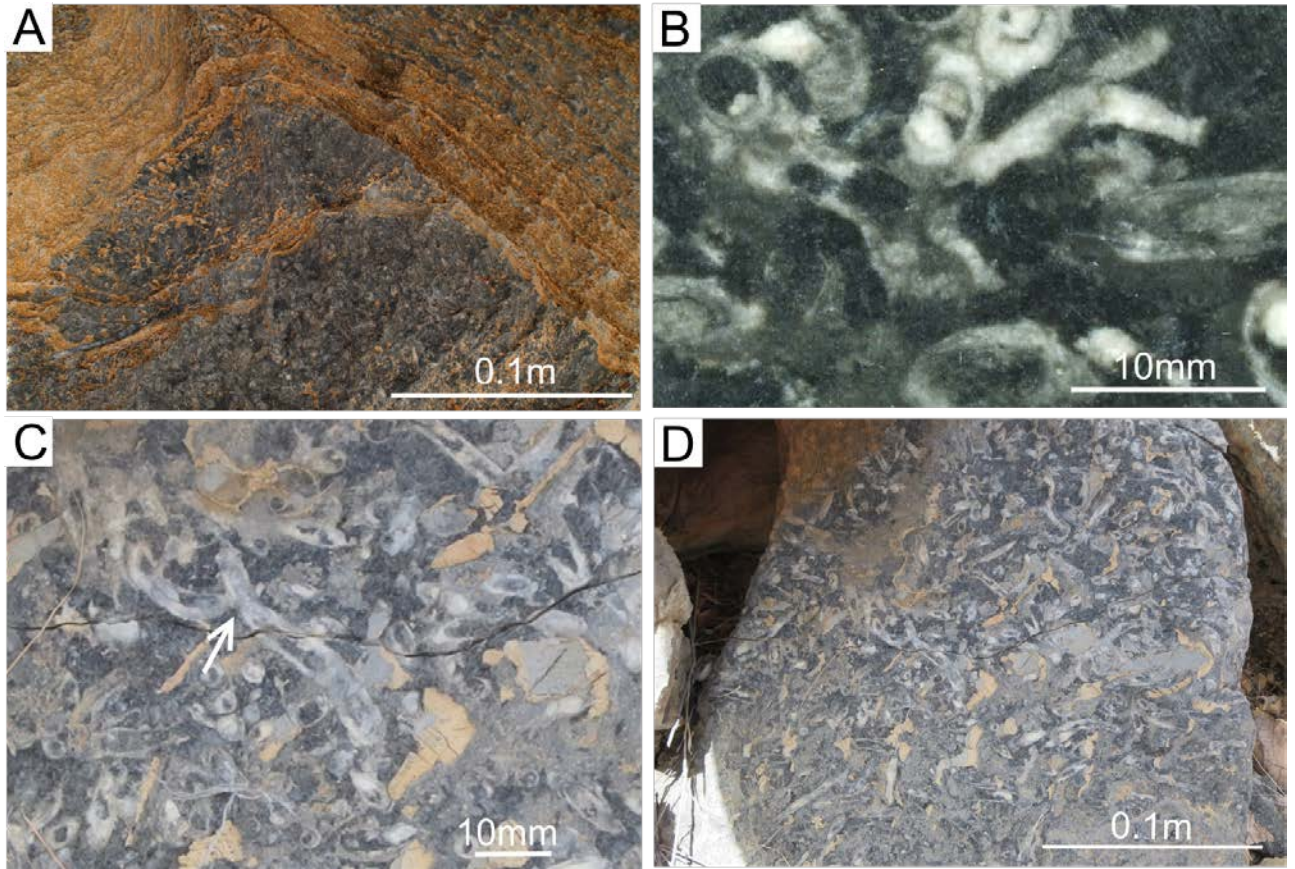


**Fig. S1**

Location and stratigraphic setting of Driedoornvlagte reef complex. **(A)** Location of Namibia in Africa. **(B)** Landsat TM image showing outcrop expression of Driedoornvlagte reef complex. Outcrop dips 40 degrees to the south. Reef is underlain by shelf facies of Omkyk Sequence 1 (OS1), and consists of a lower unit dominated by stromatolitic reefs (SR), overlain by a capping unit of mostly thrombolitic reef (TR). Stratigraphically younger shales of the Urikos Member (Kuibis Subgroup) form the poorly-exposed plain south of the reef. **(C)** Stratigraphy of the northern Nama Group (Zaris Subbasin) illustrating the position of major sequences, ranges of Ediacaran fossils, *Cloudina* and *Namacalathus*, and the position of Driedoornvlagte bioherm and associated *Namapoikia* gen. nov. Arrow indicates the stratigraphic position and age of the dated volcanic ash bed. From (7).



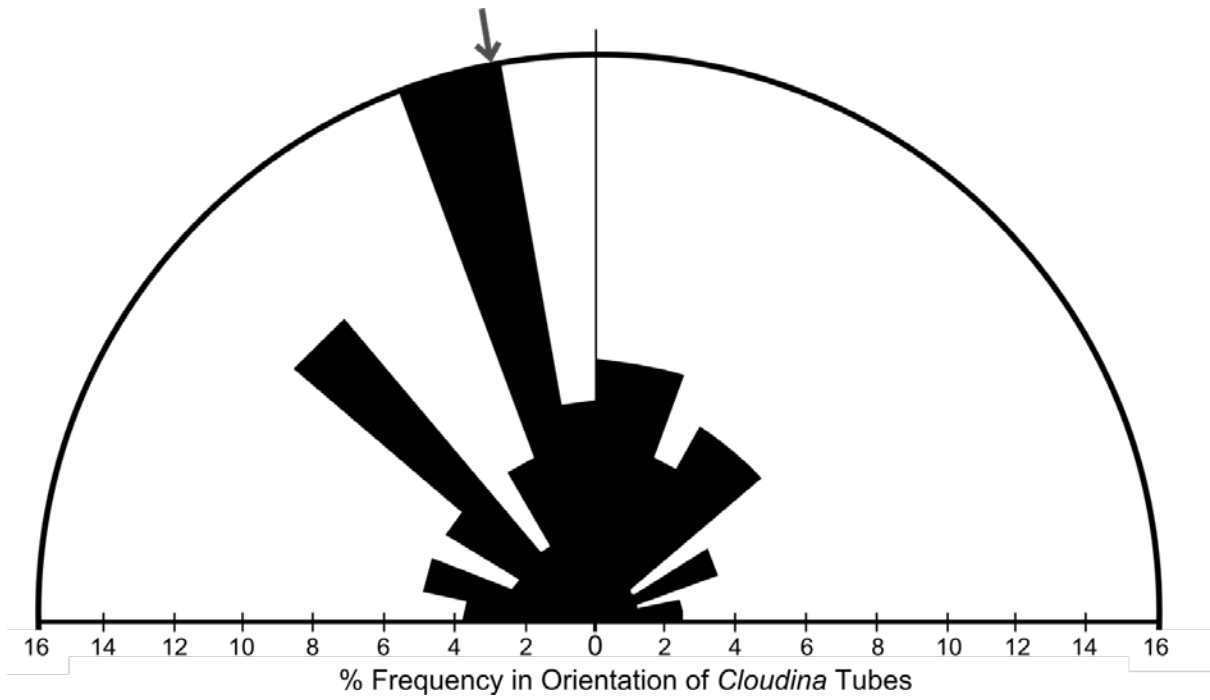
**Fig. S2**  
 Geological model for lower Nama Group (modified from 36).



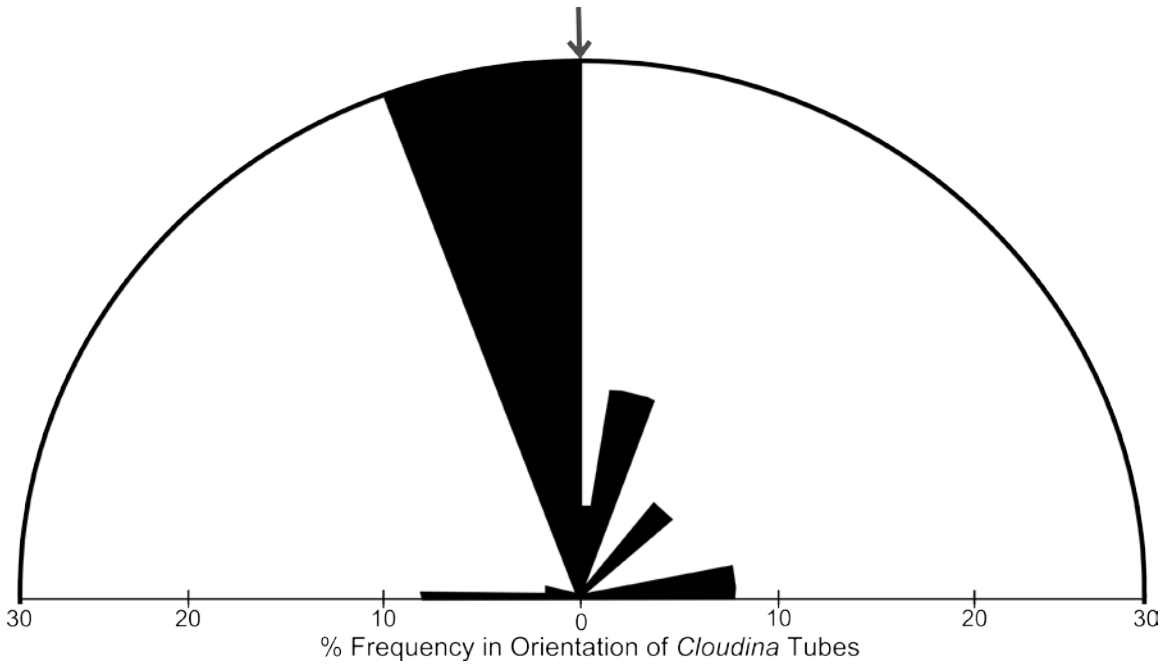
**Fig. S3**

Field photographs and polished slab images of *Cloudina* from the Driedoornvlagte reef complex; (A) Bioherm, with intermittent colonisation by stromatolitic laminae, and subsequently encrusted by thick layers of stromatolite; (B) Branching *Cloudina* tube from a polished slab; (C) Branching or budding *Cloudina* tube. Close-up from the slab illustrated in D; (D) Bedding plane containing abundant *Cloudina* embedded in early marine cement. Orientation data for these individuals is given in Fig.S4A.

**A**



**B**



**Fig. S4**

Half-rose diagram illustrating orientations of in-situ *Cloudina* individuals from **A**, Driedoornvlagte, and **B**, Swartpunt. Both datasets show a strong preferred orientation, with arrows showing the mean.



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