Abstracts in programme order (speaker indicated in bold):

Fossil evidence for the spread of toxic algal species

Andrew McMinn, Institute of Antarctic and Southern Ocean Studies, University of Tasmania. Email: andrew.mcminn@utas.edu.au. No abstract

Diatom _^{18}O evidence for the development of the modern halocline system in the subarctic North West Pacific across the ONHG boundary

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Abstract

Establishing a time frame for the development of the modern thermocline and stratified water column in the subarctic Pacific has significant palaeoclimate implications. Here we present a _$^{18}O_{(diatom)}$ record consisting of only two species that represent autumnal/winter conditions in the region across the Onset of Northern Hemisphere Glaciation boundary. At c.2.73 Ma BP, a 4.6-6.0‰ depletion is observed in _$^{18}O_{(diatom)}$ whereas previously published _$^{18}O_{(foram)}$ results show a 2.6‰ enrichment. _$^{18}O_{(diatom)}$, together with U^{k}_{37} SST reconstructions, are consistent with the development of the modern halocline with year-round stratification of the water column and a summer/autumnal temperature inversion at the ONHG. In contrast, the foraminifera _^{18}O signal is likely to be indicative of conditions beneath the mesothermal structure and/or spring conditions when the thermocline and warm SST are not present. With a _$^{18}O_{(diatom)}$ fractionation temperature coefficient of 0.4‰ to 0.5‰ per ^{0}C, the inference here of a warm pool of surface water from c.2.73 Ma BP provides a potential source for the extra moisture needed to supply the growing North American ice-sheets.

Does fluorescence tell us about heterotrophy in fossil dinoflagellates?

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Recent studies have shown that the organic cysts of some extant heterotrophic peridinioid dinoflagellates, in contrast to phototrophic dinoflagellates, do not show autofluorescence. This lead to the hypothesis, that autofluorescence of the organic walls of cysts is related to photosynthesis in the motile cells, in that metabolic products of photosynthesis are incorporated into the organic cyst wall. Also in fossil material, it has been shown that most dinoflagellate cysts show autofluorescence, whereas others having suffered the same post-depositional processes do not. It is therefore assumed, that we can use autofluorescence in fossil cysts as an indicator for phototrophy, and that those non-fluorescing cysts were formed by heterotrophic motile cells.

Dinoflagellate cysts assemblages from selected time slices from the Triassic to the Tertiary have been examined using Confocal Laser Scanning Microscopy (CLSM) for analysing their fluorescence properties. In addition to the qualitative assessment of the presence or absence of autofluorescence, CLSM was used to obtain quantitative fluorescence spectra of these fossil cysts, with the objective to reveal different wall materials in different taxonomic groups of fossil dinoflagellate cysts. This study is the first systematic survey of detailed fluorescence properties of fossil dinoflagellate cysts and will build a sound baseline of data for further studies. In the present contribution we will explain the methods used and report on the first results on the discrimination of trophic groups and on the relationship of trophic strategies to phylogeny and taxonomy.

Understanding the origin of diatoms in Lake Baikal: Interpreting the Recent and fossil specimens

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The diversity of the benthic diatom flora in Lake Baikal has been little studied in the last 50 years and remains largely unknown. A recent (1997-9) Darwin Initiative allowed a complete survey of the lake perimeter and a general assessment of its current diversity. Preliminary assessments indicate that the flora is large (in excess of 500 species) and that it includes a rather large number of endemic species, roughly a third. The relationships of the endemic species are under study with the aim to understand their origin in the lake. More recently examination of a long core has allowed a palaeontological dimension to be obtained so that the extinct diversity can be related to the current flora as well as the global distribution of certain species. In this presentation I will give several examples of the interrelationships among certain groups of diatoms in both their spatial and temporal contexts with an examination of the roles both recent and fossil distributions play in understanding the origins of Lake Baikal's diversity.

Presentation replaced by:
Opal export and burial in the Southern Ocean: *Fragilariopsis kerguelensis* versus large diatoms

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Based on the correlation of *Fragilariopsis kerguelensis* and opal downcore and the fact that this numerically dominant diatom is strongly silicified, it has been suggested that *F. kerguelensis* is the most important diatom species in opal export from the surface waters and subsequent burial into the sediments of the Southern Ocean. Numerical dominance, however, does not take into account the vast difference in cellular and frustule volume between the most widespread Antarctic diatom, and less abundant but larger species. In this study we show that the species *Thalassiothrix antarctica* and *Thalassiosira lentiginosa* can match and exceed the frustule volume of *Fragilariopsis kerguelensis*. The trend is observed not only in water column samples but core tops and downcore. Despite their lower abundance in standard micropaleontological counts, *T. antarctica* is likely to be just as important for opal export and burial as *F. kerguelensis*. Such vast differences in size and abundance will have to be considered in the bulk geochemical analysis of Southern Ocean sediments as there is evidence to suggest that the two diatoms may grow at different depths.

Is the opening of the Tasmanian Gateway related to earliest Oligocene Antarctic cryospheric development?

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Tasmanian Gateway (TG) opening during the Eocene/Oligocene transition has long been invoked as the causal mechanism for the global climate shift from the "Hothouse" world of the early Cenozoic to the "Icehouse" world of the past 35 million years. ODP Leg 189 was designed to test the hypothesis that Antarctic cryospheric evolution resulted from the thermal isolation of Antarctica, caused by the opening of the TG. The proposed mechanism specifically being investigated was the cessation of poleward penetration of

the heat-transporting, warm East Australian Current (EAC), and concomitant Antarctic Circumpolar Current (ACC) development, as the cause of the climate cooling. Five sites (1168-1172) were drilled to document paleoceanographic and paleoclimatic changes associated with the opening of the TG as Australia moved northward from Antarctica during the early Cenozoic. Demonstrating that this climatic transformation occurred immediately following significant opening of the TG is one of the major results of ODP Leg 189 (Stickley et al., in press). To elucidate pre-TG paleo-ocean circulation in this critical region, Eocene phytoplankton records from Leg 189 and other published biotic records from the circum-Antarctic are here examined for biogeographic patterns. To test the TG hypothesis further we compare model fully coupled (ocean-atmosphere-sea ice-land) climate model results for Late Eocene conditions with proxy data and isotopic climate reconstructions. We demonstrate that (1) the EAC never extended far poleward, bending eastward around the northern edge of New Zealand instead, (2) even if this current had extended to Antarctica it is unlikely that turning the current off would have initiated glaciation, (3) that the proxy data agree with the paleocurrent predictions of the model, and (4) that the field data and model responses are not consistent with TG opening as being the control on earliest Oligocene Antarctic glaciation.

Deglacial ocean and climate seasonality in laminated diatom sediments, Mac.Robertson Shelf, Antarctica

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The East Antarctic Margin (EAM) has received less attention in palaeoceanographic studies than the Western Antarctic Margin, yet its role in deep ocean circulation and therefore the global ocean system is significant. During the USA NSF Polar Programs-funded cruise of the NVIB *Nathaniel B. Palmer* (NBP0101) in February-March 2001, laminated diatom-rich sediments from the last deglaciation, were recovered from the EAM, e.g. Mertz Drift (~66°S, 143°E), Svenner Channel (~69°S, 77°E) in Prydz Bay, Nielsen Basin (~67°S, 66°E) and Iceberg Alley (~67°S, 63°E). Here, we report on the microfabric of the deglacial, varved sediments from Iceberg Alley, Mac.Roberston Shelf. Our high-resolution palaeodata records diatom productivity associated with the retreat of permanent sea ice cover, and seasonal sea-ice changes along the EAM. This information is invaluable for assessing cryospheric-oceanographic variation, and therefore, climate change.

Jumbo piston core JPC43B (Iceberg Alley), comprises 23.96 m of intermittently laminated hemipelagic sediment with the deglacial varves found between 19.13-23.96 m.

Couplets are composed of thickly laminated to thinly bedded orange/orange-brown diatom ooze (dominated by *Hyalochaete Chaetoceros* spp. resting spores, with abundant *Corethron criophilum* and *Rhizosolenia antennata* var. *semispina* in some laminae) and brown/blue-grey terrigenous angular quartz sand, silt and clays, bearing mixed diatoms. The thickness and frequency of these coupled laminations varies, becoming thinner upcore. Scanning electron microscope secondary electron imagery (SEI) of lamina 'bedding planes' and backscattered electron imagery (BSEI) of polished thin sections have been used to analyse the varves. The nature and temporal significance of the laminations are discussed in terms of seasonal deposition and cyclicity of diatom species, along the EAM in post-glacial times. With published West Antarctic studies of a similar nature, we report on how this rich archive can reveal clues about circum-Antarctic palaeoceanographic change during a time of both rapid climate change and high silica flux.

The Early Bajocian Carbon-isotope Shift - Radiolarian and Dinoflagellate Response

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A positive carbon-isotope excursion from 1.5 to 3 ‰ in $\delta^{13}C$ in late early Bajocian time has been documented from several Tethyan sections. This peak is double-pronged: $\delta^{13}C$ values increase by about 1.5 ‰ during the *discites* and *laeviscula* Zones and first peak in the *sauzei* Zone. After a minimum in the lower *humphriesianum* Zone values peak again in the higher part of that zone, stay high in the *niortense* Zone and then gradually drop off during the rest of the late Bajocian and early Bathonian. In sensitive areas like the Umbria-Marche palaeogeographic zone of the Northern Apennines, the positive excursion correlates with more chert-rich lithologies, suggesting higher radiolarian and siliceous sponge productivity. In many Tethyan basinal sections, like those of the Lombardy Basin in the Southern Alps, lime-free radiolarites replace siliceous pelagic limestones from the *sauzei* or *humphiesianum* Zone upsection.

With the Unitary Association method we quantitatively compiled first (FAD) versus last (LAD) appearances of over 400 radiolarian taxa for 79 Unitary Associations through the Middle to Late Jurassic from Tethyan sections and found a characteristic response to this carbon isotope excursion: FADs dominate over LADs, suggesting diversification during the early Bajocian rise of carbon-isotope values. Then, during the second isotope peak (*humphiesianum-niortense*) this tendency is reversed and LADs dominate over FADs indicating abundant extinctions. A gradual increase in FADs then occurs during the late Bajocian-early Bathonian. The response of index species diversity is somewhat different: it is lowest during the isotopic rise and highest during the isotopic minimum during the late Bajocian-Bathonian. Thus, high silica productivity/preservation occurred during carbon isotopic highs and resulted in low radiolarian diversity, while low

silica productivity occurred during isotopic lows and show high radiolarian diversity, where preservation is sufficient to reveal complete assemblages.

The dinoflagellate response seems to be almost contrary to the radiolarian response: peak diversification is observed in *humphiesianum* and *niortense* Zones, when carbon isotopes are maximal. This mid-Bajocian diversification event corresponds to the onset of the major dinoflagellate cyst radiation of the Mesozoic. This concerns especially one family, the Gonyaulacaceae, which is the most diverse dinoflagellate cyst family in the Mesozoic and Cainozoic. We conclude that thriving radiolarian and dinoflagellate productivity during the Middle Jurassic periods of high _^{13}C are indicative of moderate eutrophication of Tethyan surface waters. When _^{13}C is highest, radiolarian diversity drops drastically, while dinoflagellate diversity increases. This response suggests less tolerance of most radiolarian taxa to eutrophication as compared to dinoflagellates, which thrived during most eutrophic times. During the Cretaceous anoxic events, higher positive carbon excursions and the dropout of biogenic silica production during the peak of the events suggest more important eutrophication as compared to the Jurassic.

(Paleo)limnology and diatom assemblages of oligotrophic lakes in the Amery Oasis (East Antarctica)

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Antarctic freshwater ecosystems are characterized by persistent low temperatures, prolonged ice-cover, extremes in irradiance, short growing seasons, reduced bioproductivity and low biota diversity. Within the Australian research programme *Palaeoenvironments of the Antarctic coast, from 50ºE to 120ºE*, three lakes of the Amery Oasis, northern Prince Charles Mountains, East Antarctica, were analyzed on their limnology and diatom flora. The three investigated lakes, Terrasovoje Lake (31 m water depth) and Radok Lake (min. 357 m), both meltwater reservoirs, and Beaver Lake (> 400 m), an epishelf lake, show minor to moderate vertical changes in conductivity, pH, temperature and oxygen content. The lakes of the Amery Oasis are cold, ultra-oligotrophic lakes with moderate (Terrasovoje and Radok Lakes) to high (Beaver Lake) ion concentrations. Beaver Lake has a chemocline at 20-30 m water depth which separates warmer freshwater at the surface (~ 3500 _S cm $^{-1}$) from colder and denser deep water (~ 6500 _S cm $^{-1}$).

Planktonic diatoms were not present in any of the three lakes during austral summer 2001/2002. However, 34 benthic diatom taxa could be identified from sediments recovered in Terrasovoje and Radok Lakes whereas the sediments of Beaver Lake do not contain any diatoms. A 552 cm long sediment core recovered in Terrasovoje Lake reflects the late Pleistocene to Holocene environmental history of the Amery Oasis. The

diatom assemblages in this sediment core together with changes of several geochemical indicators reveal distinct relative changes of past temperature, productivity and bottom water conditions.

Synchronous Eocene/Oligocene high latitude cooling: ODP Site 913, Norwegian-Greenland Sea

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The Eocene-Oligocene interval was a critical phase in earth history, marking a major climatic transition from greenhouse conditions in the Cretaceous to icehouse conditions in the Cenozoic. Stable oxygen isotope data indicate that, after the late Palaeocene-early Eocene thermal maximum, a long-term cooling trend began at about 52 Ma which culminated in a permanent drop in oceanic bottom water temperatures at the Eocene-Oligocene (E/O) boundary. The climatic deterioration is manifested as a series of cooling episodes, partly reflected in the biotic realm by stepwise faunal and floral extinctions as temperature sensitive species were replaced by more tolerant taxa. Here we present a dinoflagellate cyst-based relative sea surface temperature curve (DTC) for the E/O section of ODP Hole 913B, drilled in the Norwegian-Greenland Sea. This first E/O SST curve for high Northern latitudes records cooling episodes that are synchronous with the Southern Ocean record for this period. Micropalaeontological and geochemical proxies indicate that the increased productivity represented by the biogenic sediments deposited during these cooling episodes, were the result of increases in nutrient supply due to enhanced atmospheric and oceanic circulation. Moreover, the identification of ice-rafted debris in Hole 913B, provides evidence for possible Northern Hemisphere glaciation, or at least the presence of seasonal sea-ice, during the latest Eocene cooling phase, which also corresponds with an intensification of the East Antarctic Ice Shelf at the Eocene-Oligocene boundary.

A new technique to compare transmitted light and scanning electron micrographs: Applied to low-latitude Palaeogene Radiolaria

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We propose a simple, time efficient technique to produce comparative composite focal depth TL and SEM images of single specimens of low-latitude Palaeogene radiolarians. SEM precedes TL microscopy:
(1) A cover slip (12mm Ø) is prepared with clear nail varnish diluted in acetone to securely adhere the specimens. Once arranged on the cover slip, the varnish is softened with acetone fumes to fix the specimens. Nail varnish provides an even, smooth surface for background contrast. (2) Uncoated specimens are photographed in low vacuum (40-50 Pa) to avoid charging. The cover slip is fixed to a 25 mm Ø stub with beryllium levers allowing electrical earthing and removal of the cover slip. Decreased cover slip Ø to stub Ø ratio and a fine coating of antistatic spray further prevents charging (3) After SEM work the cover slip is removed, overturned and mounted on a glass slide for TL microscopy. Composite focal depth TL microscopy uses a series of images taken in focus throughout the thickness of a radiolarian specimen. An algorithm extracts the focused portions of each image to produce a composite image showing sharpness throughout the specimen.
Advantages of this technique are: (1) it produces comparative TL and SEM illustrations that help clarify radiolarian taxonomy (2) there is minimal risk of damaging specimens during picking and mounting for SEM and TL illustration, (3) in comparison with published techniques to illustrate single specimens by TL and SEM our technique is more time efficient and materials used are less toxic.
This technique is used to study entire radiolarian faunal assemblages of the low-latitude Palaeocene - lower Eocene as: (1) the total number of radiolarian species in a sample at any given time is approximately 150 and a high proportion remain unclassified, plus there are radiolarian events that are not yet documented. Thus radiolarian faunal turnover is poorly known during significant global climate and ocean circulation changes across the P-E boundary and the LPTM interval, (2) presently zones RP1-RP5 of the earliest Palaeocene are only demonstrated in high latitudes, (3) DSDP/ODP topotypic material photographed using this technique aids identification of diagenetically altered specimens from land sections. We will construct assemblage zones based on abundant and more robust taxa readily found in orogenic sections.

Palaeoceanography of the South Tasman Rise during MIS 10-12 from diatom and dinocyst analyses

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Diatom analysis is used to help reconstruct palaeoceanographic conditions of the South Tasman Rise (STR) at Site 1171 of Ocean Drilling Program (ODP) Leg 189, during MIS 10-12 at a resolution of ~3 kyr. Emphasis is placed on Termination V (434-423 ka) and

the Mid-Brunhes Event (MBE) at ~400 kyr. Site 1171 is located in lower bathyal water depths of ~2150 m on a gentle southwesterly slope on the southernmost STR, ~550 km south of Tasmania and 270 km southeast of Site 1170. At 48°S, it lies in subantarctic waters between the Subtropical Front to the north and the Subantarctic Front to the south. Four holes were drilled at Site 1171; this presentation primarily covers our initial findings of diatom analysis from Hole 1171A.

Four distinct diatom assemblages are defined by cluster analysis; the characteristic diatom species for each assemblage defined by correspondence analysis. Three of these assemblages indicate possible latitudinal movement of oceanographic fronts in the region during MIS 10-12, although data from nearby sites is required to confirm this. Diatom accumulation rate data are presented which indicate changing flux rates associated with oceanographic movement. Flux rates are greatest during early MIS 11, following Termination V which appears to have been a time of intense silica dissolution apparent by very poorly preserved, dissolved diatom valves. Dissolution may have been enhanced at this time by an increase in wind-blown dust to the STR.

An assessment is made on how widespread or localised our findings are by comparison with published work from ODP 177 (South Atlantic sector). This work represents the initial findings of diatom and analysis for MIS 11 times over the STR. Work is underway to complete the analysis for both diatoms and dinocysts for Site 1170 and 1171 in order to make a fuller assessment of palaeoenvironmental conditions for the STR.

The first substantial UK onshore occurrence of Middle Eocene diatoms: comparisons with published palynological data, and implications for palaeoceanographic change

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Sampling of the Bracklesham Group sediments of Whitecliff Bay, Isle of Wight, has led to the discovery of an assemblage of marine diatoms in a series of clays previously thought to be barren of microfossils. Although preserved as pyritised steinkerns, enough detail is present in most cases to allow identification to species level. They include several stratigraphically restricted taxa, including *Brightwellia hyperborea* and *Aulacodiscus subexcavatus*, which allow the assemblage to be placed within the

Triceratium kanayae diatom zone of the Middle Eocene. This is equivalent to calcareous nannoplankton zone NP15, and confirms a Lutetian age.

The assemblage is dominated by the large centric diatom *Fenestrella antiqua* (previously *Coscinodiscus* sp. 1 of many industry workers), previously unknown in sediments later than earliest Eocene worldwide, and its occurrence in this sequence therefore extends the known range of this species into the Middle Eocene.

The diatoms recovered include both low-latitude planktic species and more cosmopolitan coastal and nearshore taxa, attesting to strong connections to both southerly, warmer waters as well as cooler waters to the north and east. Data include the presence of the larger foraminiferid *Nummulites laevigatus* from beds above and below the diatom-bearing level, further confirming warm conditions around the time of deposition, whilst palynological evidence shows the presence of peridinioid dinoflagellates in the diatom-bearing section. Diatom-rich sections in the late Cretaceous to mid Tertiary of the North West Europe continental shelf are known to coincide with abundances of peridinioid dinoflagellates belonging to the genera *Phthanoperidinium* and *Wetzelliella*, and their co-occurrence suggests the presence of eutrophic, nutrient-rich conditions in surface waters, attributable to episodes of water column stratification and reduced water circulation. The publication of industrial records showing this phenomenon is badly needed, as it will help to refine palaeonvironmental interpretations in offshore sections, as well as adding to knowledge of marine circulation changes in the later Mesozoic and Cenozoic worldwide.

The White Stone Band of the Kimmeridge Clay Formation, an integrated high-resolution approach to understanding environmental change

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The Kimmeridge Clay is a Jurassic mudrock succession that shows Milankovitch Band climatic cyclicity. A key issue is to determine how the subtle changes that define this cyclicity result from climatic change. Using material from the Natural Environment Research Council Rapid Global Geological Events (RGGE) Kimmeridge Drilling Project boreholes, the White Stone Band was investigated at the lamination scale using BSEI and quantitative palynofacies. Fabric analysis shows the lamination to represent successive deposition of coccolith-rich and organic-matter-rich layers. Individual laminae contain unsorted palynological debris with no differential input of marine and terrestrial components. Such input is interpreted as storm transport. Linking water column processes to laminae deposition indicates seasonal input with an initial coccolith bloom followed by a more diverse assemblage including dinoflagellates and photosynthetic chlorobiaceaen bacteria. As the photic zone extended into the euxinic water column organic matter export to the seabed underwent minimal cycling through oxidation and subsequently became preserved through sulphurization with greatly increased

sequestration of carbon. This was significantly increased by late season storm-driven mixing of euxinic water into the photic zone. Increased frequency of storm systems would therefore dilute the coccolith input to give an oil shale. Hence climatically induced changes in storm frequency would progressively vary the organic content of the sediment and generate the climate cycle signal.

The biotic response of calcareous nannofossils to the Messinian Salinity Crisis, Cyprus

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The rapidly changing and extreme environmental conditions of the early Messinian Salinity Crisis are reflected in abrupt variations in nannofossil assemblages within the Messinian units (Kalavasos Formation) from the Polemi Basin, Cyprus. During the Messinian, the Polemi Basin was a semi-enclosed, neritic to littoral environment, subject to repeated influxes of marine and freshwater. Nannofossil diversity (3 to 11 species) is greatly reduced in comparison to the open ocean and assemblages are highly uneven with high dominance. One of five nannoplankton species were observed to dominate any of the assemblages, these were *Reticulofenestra minuta*, *Dictyococcites antarcticus*, *Helicosphaera carteri*, *Umbilicosphaera jafari* and *Sphenolithus abies*. The associated diatom and sedimentological evidence from the Polemi Basin are used to indicate the palaeoecology of key nannofossil taxa. *D. antarcticus* predominated in normal salinity, mesotrophic, shallow water environments; *H. carteri* in shallow, hyper-eutrophic environments with enhanced salinity; *U. jafari* hypersaline conditions; *R. minuta* in hyper-eutrophic conditions with an abnormal salinity from brackish to hypersaline; *S. abies* in mesotrophic, deeper and normal salinity environments. These species are indicated to be opportunistic taxa, adapted to unstable environments. Fluctuations in nutrient levels and salinity are interpreted as the primary factors controlling the overall nature of the nannoplankton assemblages and the species which dominate at any one level.

Are diatom records from Antarctic coastal sediments anything but relict assemblages?

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Palaeoecological information from fossil diatom assemblages is widely used in the reconstruction of ocean and climate history, particularly in the Southern Ocean. When analysing the diatom record of palaeoceanographic change it is important to understand the taphonomic processes that act to produce the fossil record from the original water column assemblages. It is acknowledged that only a fraction of the diatom flora in the water will be preserved in the sediment – weakly silicified diatoms that are important in surface waters are often dissolved before they become incorporated into the fossil record whilst robust, heavily silicified taxa are dissolution resistant and often over represented in the fossil record. This study aims to address the magnitude of the introduced bias and assess the implications for diatom-based palaeoceanographic reconstructions, and is the first detailed comparison of diatom surface water assemblages with those in the underlying sediments across the Scotia Sea and around the Antarctic Peninsula (AP). Water samples were collected during austral summer 2001-02 and austral spring 2003-04 aboard the RRS *James Clark Ross* and traverse the major oceanographic boundaries of the Scotia Sea and AP including the Polar Front and the sea-ice zone. Water column assemblages have been compared with existing surface sediment samples from the region to assess the contribution of the surface water community to the fossil assemblage. Results from the first season demonstrate that summer surface water assemblages are very poorly represented in the fossil record and data from the western Antarctic Peninsula will be presented. The fossil assemblages are either (1) dominated by spring diatom flux, or (2) taphonomic processes significantly distort the signal of the water column assemblage, hence the palaeoenvironmental data available. The results from the second season (spring) of data will provide the necessary information to address these scenarios and assess the full impact of taphonomy on the diatom fossil record from coastal Antarctica.

New data on the palaeoecology of Late Cretaceous dinoflagellates from shallow Chalk Sea sequences

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The dinoflagellate cyst record from an Upper Cretaceous (uppermost Cenomanian—upper Coniacian) Chalk core, drilled at Banterwick Barn, Berkshire, is described and statistically correlated with elemental and stable isotope bulk sediment geochemical data from the same core. Seventy-two dinocyst species and subspecies are recorded, and stable carbon and oxygen isotopic ($\delta^{13}C$, $\delta^{18}O$) trends are documented. Lithostratigraphy and chemostratigraphic correlation of the $\delta^{13}C$ curve with an expanded section at Dover, Kent, are used to identify stratigraphically significant marls, and

determine the positions of macrofossil zones and stage boundaries in the Banterwick Barn core. These data indicate that >30 m of chalk at Dover are represented by <2 m of Chalk Rock at Banterwick Barn, with much of the succession being absent due to erosion and non-deposition. First and last appearance datums (FAD, LAD), first and last common occurrences, and acmes of key Turonian—Coniacian dinocyst species are documented and compared with other records from the Anglo—Paris Basin. An extremely impoverished assemblage of dinocysts in the highest Cenomanian to lowest Turonian is considered to be largely a preservational artefact of intraclastic nodular and calcarenitic chalks, and is not related directly to the well-documented global oceanic anoxic event (OAE2) occurring at that time (~93.5 Ma). A sharp increase in dinocyst abundance in the lower Turonian corresponds with a change in lithology to more marly chalks. A gradual decrease in the number of species is observed through the middle Turonian to upper Coniacian; $\delta^{18}O$ records show that this was associated with global climatic cooling. Cluster analysis of the dinocyst abundance record with geochemical data indicates four distinct species groups with characteristic geochemical associations. Groups 1 and 2 are associated with phases of increased siliciclastic supply; a positive correlation with higher $\delta^{13}C$ values differentiates the latter. Group 3 is independent of carbonate and detrital input, and Group 4 is associated with high carbonate flux and low detrital supply. These groupings suggest that cyst-forming dinoflagellates exhibited a range of ecological niches in the Late Cretaceous. Key environmental factors are likely to be sea-level and climate related, controlling nutrient supply, sea-surface temperature, and environmental stability.