

South African Research on volcanic and related rocks and mantle-derived materials: 2003-2006

J.S. Marsh
South African National Correspondent, IAVCEI
Department of Geology
Rhodes University
Grahamstown 6140
South Africa

South Africa has no formal organizational or research structures dedicated to the principle aims of International Association of Volcanology and Chemistry of Earth's Interior (IAVCEI) and over the period of the review there were no national research programmes which advance the main thrusts of IAVCEI. The association has a system of personal membership and the number of IAVCEI members in South Africa has not generally exceeded half a dozen over the period under review, although the potential membership is much greater as there are many scientists carrying out research on volcanic and intrusive rocks as well as mantle materials. These researchers are largely based at universities, the Council for Geoscience, as well as some mining and exploration companies, particularly those with interests in mineralization associated with the Bushveld Complex as well as diamondiferous kimberlite. Over the period of review the research of small informal groups and individuals has produced a substantial number of papers in igneous rocks and mantle materials. These outputs can be conveniently grouped as follows.

Archaean Greenstones and Granitoids and Proterozoic Igneous suites.

There is a steady output of research in these areas particularly in Archaean suites with interest in both the ultramafic-mafic komatiitic rocks as well as granitoids. Of note is the description of a new class of komatiite characterized by high silica and ultra depletion in incompatible elements.

Bushveld Complex

The Bushveld Complex one of the world's largest layered igneous complexes is host to giant ore deposits of Cr, PGE, and V. This mineralization ensures a steady output of research directed towards unravelling the emplacement and evolution of the complex and associated intrusive and volcanic rocks. Much of the research effort emanates from the Department of Geosciences at the University of Witwatersrand where a specialised Bushveld Complex Research Group is directed by Prof Grant Cawthorn.

Mesozoic Flood Volcanism

Southern Africa is host to two large Mesozoic flood volcanic provinces - the early Jurassic Karoo Province and the early Cretaceous Etendeka Province along the Atlantic seaboard of South Africa and Namibia. Both of these feature in the research outputs. There has been a renewed interest in detailed dating in the Karoo, largely by foreign-based scientists with South African collaboration. Mineralization in Karoo intrusions has also received attention. In the Etendeka comprehensive petrogenetic models arising from decades of research have also been published.

Kimberlite and Mantle Materials

Southern Africa with its abundant diamondiferous kimberlite bodies has long been a focus of research into the nature of kimberlite as well as mantle materials contained within kimberlite. South African based scientists continue to feature prominently in kimberlite and mantle research. In recent years the Kaapvaal Craton Project as well as the 8th International Kimberlite Conference which was held in Canada in 2003 provided the impetus for publication, during the period under review, of special issues of the South African Journal of Geology (Kaapvaal Craton Project) and Lithos (Kimberlite Conference). The two special volumes of Lithos were named the Hawthorne and Clement volumes in honour of two South African geoscientists who made significant contributions to kimberlite volcanology and petrology. There is currently a renewed interest in kimberlite volcanology and emplacement as well as the chemical characterization of kimberlite liquid. With regard to the latter, significant contributions have been made by A.P. Le Roex and co-workers at the University of Cape Town. However, kimberlite remains the richest source of samples from the otherwise inaccessible interior of Earth and publications on these still dominate the research outputs.

The principle behind the compilation of publications list below is that the research output should be authored or co-authored by South African-based geoscientists at the time of publication. Some of this research has been done outside national boundaries. Likewise there is a considerable amount of published research on South African rocks from foreign research groups without South African involvement. Such outputs have not been included. Also not included are conference presentations and abstract volumes. The publications cover the period 2003-2006 and this has raised another problem in that on-line publication may precede paper publication by several months. A decision was made to use the paper publication date as a basis for compiling the list. In addition I have attempted to include only those publications which address the direct interests of IAVCEI. As these are broad, a decision regarding relevance is sometimes difficult to make. Nevertheless the papers listed below, the majority in top quality international journals, attest to a significant contribution by South African scientists to IAVCEI.

ARCHAEAN MAGMATISM

Anhaeusser C. R. (2004). Palaeoarchaeoan to Mesoproterozoic (c. 3500-1000 Ma) ultramafic and mafic intrusions of the Kaapvaal Craton and neighbouring metamorphic belts: a review. *Inform. Circ. Econ. Geol. Res. Inst., Univ. Witwatersrand, Johannesburg*, **384**, 63 pp.

Anhaeusser C. R. and Poujol M. (2004). Petrological, geochemical and U-Pb isotopic studies of Archaean granitoid rocks of the Makoppa Dome, northwest Limpopo Province, South Africa. *S. Afr. J. Geol.*, **107**, 521-544.

Banerjee N.R., Furnes H., Muehlenbachs K., Hubert Staudigel H., and De Wit M. (2006). Preservation of 3.4—3.5 Ga microbial biomarkers in pillow lavas and hyaloclastites from the Barberton Greenstone Belt, South Africa. *Earth Planet. Sci. Lett.*, **241**, 707-722.

Clemens J.D., Yearron L.M., and Stevens G. (2006). Barberton (South Africa) TTG magmas: Geochemical and experimental constraints on source-rock petrology, pressure of

formation and tectonic setting. *Precambrian Res.*, **151**,53-78.

Hart R.J. McDonald I., Tredoux M., De Wit M.J., Carlson R.W., Andreoli M., Moser D.E and Ashwal L.D. (2004). New PGE and Re/Os-isotope data from the lower crustal sections of the Vredefort Dome and a reinterpretation of its “crust on edge” profile. *S. Afr. J. Geol.*, **107**, 173-184.

Lana C., Gibson R.L., Reimold W.U. and Minnitt R.C.A. (2003). Geology and geochemistry of a granite-greenstone association in the southeastern Vredefort dome, South Africa. *S. Afr. J. Geol.*, **106**, 291-314.

Maier W.D. (2003). The potential for magmatic sulfide ores in South African komatiites: a review. *S. Afr. J. Geol.*, **106**, 35-40.

Maier W.D., Roelofse F., and Barnes S-J. (2003). The Concentration of the Platinum-Group Elements in South African Komatiites: Implications for Mantle Sources, Melting Regime and PGE Fractionation during Crystallization. *J. Petrol.*, **44**, 1787-1804.

Martin H., Smithies R.H., Rapp R., Moyen J.-F. and Champion, D. (2005). An overview of adakite, TTG and sanukitoid: relationships and some implications for crustal evolution. *Lithos*, **79**,1-24.

Parman S.W. Grove T.L., Dann J.C. and De Wit M. (2004). A subduction origin for komatiites and cratonic lithospheric mantle. *S. Afr. J. Geol.*, **107**, 107-118.

Poujol M., Robb L. J.,Anhaeusser C.R. and Gericke B. (2003). A review of the geochronological constraints on the evolution of the Kaapvaal Craton, South Africa. *Precambrian Res.*, **127**, 181-213.

Poujol M., Kiefer R., Robb L. J., Anhaeusser, C. R. and Armstrong R. A. (2005). New U-Pb data on zircons from the Amalia greenstone belt Southern Africa: insights into the Neoproterozoic evolution of the Kaapvaal Craton. *S. Afr. J. Geol.*, **108**, 317-332

Steenfelt A., Garde A.A., and Moyen J.-F. (2005). Mantle wedge involvement in the petrogenesis of Archaean grey gneisses in West Greenland. *Lithos*, **79**, 207-228.

Wilson A.H (2003) A new class of silica enriched, highly depleted komatiites in the southern Kaapvaal Craton, South Africa. *Precambrian Res.*, **127**, 125-141.

Wilson A.H., Shirey S.B., Carlson R.W. (2003) Archaean ultra-depleted komatiites formed by hydrous melting of cratonic mantle. *Nature*, **423**, 858-861.

PROTEROZOIC SUITES

De Waal S.A. Xu Z., Li C. and Mouri H. (2004). Emplacement of viscous mushes in the Jinchuan ultramafic intrusion, western China. *Canadian Mineralogist*, **42**, 371-392.

De Waal S.B., Graham I.T. and Armstrong R.A. (2006) The Lindeques Drift and Heidelberg intrusions and the Roodekraal complex, Vredefort, South Africa: comagmatic plutonic and volcanic products of a 2055 Ma ferrobasaltic magma. *S. Afr. J. Geol.*, **109**, 279-300.

McMillan A., Harris N.B.W., Holness M., Ashwal L.D., Kelly, S. and Rabeloson R. (2003) A granite-gabbro complex from Madagascar: constraints on melting of the lower crust. *Contrib. Mineral. Petrol.*, **145**, 585-599.

Pandit M.K., Carter L.M., Ashwal L.D., Tucker R.D., Torsvik T.H., Jamtveit B. and Bhushan S.K. (2003). Age, petrogenesis and significance of Early Neoproterozoic granitoids and related rocks from the Sendra area, Aravalli Craton, NW India. *J. Asian Earth Sci.*, **22**, 363-381.

Prevec S.A, and Baadsgaard H. (2005). Evolution of Palaeoproterozoic mafic intrusions located within the thermal aureole of the Sudbury Igneous Complex, Canada: Isotopic, geochronological and geochemical evidence. *Geochim. Cosmochim. Acta*, **69**, 3653-3669

BUSHVELD COMPLEX

Arndt N., Jenner G., Ohnenstetter M., Deloule E. and Wilson, A.H. (2005) Trace elements in the merensky Reef and adjacent norites, Bushveld Complex, South Africa. *Mineralium Deposita*, **40**, 550-575.

Ashwal L.D., Webb S.J. Knoper M.W.(2005). Magmatic stratigraphy in the Bushveld Northern Lobe: continuous geophysical and mineralogical data from the 2950m Bellevue drillcore. *S. Afr. J. Geol.*, **108**, 199-232.

Baillie R.H.and Robb L.J.(2004). Polymetallic mineralization in the granites of the Bushveld Complex - examples from the central southeastern lobe. *S. Afr. J. Geol.*, **107**, 633-652.

Barnes S.-J., Maier W.D. and Ashwal L.D. (2004). Platinum-group element distribution in the Main Zone and in the Upper Zone of the Northern Limb of the Bushveld Complex. *Chem. Geol.*, **208**, 293-317.

Boorman S., Boudreau A. and Kruger F.J. (2004). The Lower Zone-Critical Zone transition in the Bushveld Complex: a quantitative textural study. *J. Petrol.*, **45**, 1209-1235.

Boorman S.L., McGuire J.B. Boudreau A.E. and Kruger F.J. (2003). Fluid overpressure in layered intrusions: formation of a breccia pipe in the eastern Bushveld Complex, republic of South Africa. *Mineralium Deposita*, **38**, 356-369.

Cawthorn R.G. (2003). Genesis of magmatic oxide deposits — a view from the Bushveld Complex. *Norges Geologiske Undersokelse, Spec. Publ.* **9**, 11-20.

Cawthorn R.G. and Spies, L. (2003). Plagioclase-rich cyclic units in the Bushveld Complex. *Contrib. Mineral. Petrol.*, **145**, 47-60.

Cawthorn R.G. and Kruger F.J. (2004). Petrology and Ni-Cu-PGE potential of the Insizwa lobe, Mount Ayliff Intrusion, South Africa. *Canadian Mineralogist*, **42**, 303-324.

Cawthorn R.G. (2005). Contrasting sulphide contents of the Bushveld and Sudbury Igneous Complexes. *Mineralium Deposita*, **40**, 1-12.

Cawthorn, R.G. (2005). Pressure fluctuations and the formation of the PGE-rich Merensky and chromitite reefs, Bushveld Complex. *Mineralium Deposita*, **40**, 231-235.

Cawthorn R.G. (2005). Stratiform PGE deposits in layered intrusions. *Mineralogical Association of Canada, Short Course Volume*, **35**, 57-73.

Cawthorn R.G., Barnes S.J., Ballhaus C. and Malitch K.N. (2005). Platinum-group element, chromium, and vanadium deposits in mafic and ultramafic rocks. *Econ. Geol.*, **100**, 215-249.

Gerya T.V., Uken R., Reinhardt J., Watkeys M.K., Maresch W.V. and Clarke B.M. (2003). Cold fingers in a hot magma: country rock diapirs triggered by the Bushveld layered intrusion, South Africa. *Geology*, **31**, 753-756

Harris C., Pronost J.J.M., Ashwal L.D. and Cawthorn R.G. (2005) Oxygen and hydrogen isotope stratigraphy of the Rustenburg Layered Suite, Bushveld Complex: Constraints on crustal contamination. *J. Petrol.*, **46**, 579-602

Harris N., McMillan A., Holness M., Uken R., Watkeys M.K., Rogers N. and Fallick A. (2003). Melt generation and fluid flow in the thermal aureole of the Bushveld Complex. *J. Petrol.*, **44**, 1031-1054.

Johnson T.E., Gibson R.L., Brown M., Buick I.S., and Ian Cartwright I. (2003). Partial Melting of Metapelitic Rocks Beneath the Bushveld Complex, South Africa. *J. Petrol.*, **44**, 789-813

Kinnaird J.A., Kruger F.J. and Cawthorn R.G. (2004). Rb-Sr and Nd-Sm isotopes in fluorite related to the granites of the Bushveld Complex. *S. Afr. J. Geol.*, **107**, 413-430.

Kinnaird J.A., Hutchinson D., Schurmann L., Nex, P.A.M. and De Lange R. (2005). Petrology and mineralization of the southern Platreef: northern limb of the Bushveld Complex, South Africa. *Mineralium Deposita*, **40**, 576-597.

Kruger F.J. (2005). Filling the Bushveld complex magma chamber: lateral expansion, roof and floor interaction, magmatic unconformities and the formation of giant chromitite, PGE and Ti-V-magnetite deposits. *Mineralium Deposita*, **40**, 451-472.

Letts, S., Torsvik, T.H., Webb, S.J., Ashwal, L.D., Eide, E.A. and Chunnnett, G. (2005). Palaeomagnetism and $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology of mafic dykes from the eastern Bushveld Complex (South Africa). *Geophys. J. International*, **162**, 36-48.

Maier W.D. and Barnes S-J. (2003) Platinum-group elements in the Boulder bed, western Bushveld Complex, South Africa. *Mineralium Deposita*, **38**, 370-380.

Maier W.D., Gomwe R., Barnes S-J., Li C. and Theart H. (2004). Platinum group elements in the Uitkomst complex, South Africa. *Econ. Geol.*, **99**, 499-516.

Manyeruke T.D., Maier W.D. and Barnes S-J. (2005). Major and trace element geochemistry of the Platreef on the farm Townlands, northern Bushveld Complex. *S. Afr. J. Geol.*, **108**, 381-396.

Prevec, S.A., Ashwal, L.D. and Mkaza, M.S. (2005). Mineral disequilibrium from the Merensky pegmatoid, western Bushveld Complex, South Africa: new Sm-Nd isotopic evidence. *Contrib. Mineral. Petrol.*, **149**, 306-315.

Scoon R.N. and Mitchell A.A. (2004). The platiniferous dunite pipes in the eastern limb of the Bushveld Complex: review and comparison with unmineralised discordant ultramafic bodies. *S. Afr. J. Geol.*, **107**, 505-520.

Scoon R.N. and Mitchell A.A. (2004). Petrogenesis of discordant magnesian dunite pipes from the central sector of the eastern Bushveld Complex with emphasis on the Winaarshoek Pipe and disruption of the Merensky Reef. *Econ. Geol.*, **99**, 517-542.

Seabrook C.L., Cawthorn R.G. and Kruger F.J. (2005). The Merensky Reef, Bushveld complex: mixing of minerals not mixing of magmas. *Econ Geol.*, **100**, 1191-1206.

Smith D.S. and Basson I.J. (2006). Shape and distribution analysis of Merensky Reef potholing, Northam Platinum Mine, western Bushveld Complex: implications for pothole formation and growth. *Mineralium Deposita*, **41**, 281-295.

Smith, D., Basson, I.J. and Reid, D.L. (2004). The normal reef sub-facies of the Merensky Reef at Northam platinum mine, Zwartklip facies, western Bushveld Complex. *Canadian Mineralogist*, **42**, 243-260.

Van Der Merwe J. and Cawthorn R.G. (2005). Structures at the base of the Upper Group 2 chromitite layer, Bushveld Complex, South Africa, on Karee Mine (Lonmin Platinum). *Lithos*, **83**, p. 214-228.

Webb S. J., Cawthorn R. G., Nguuri T. K., and James D. E. (2004). Gravity modeling of Bushveld Complex connectivity supported by Southern African Seismic Experiment results. *S. Afr. J. Geol.*, **107**, 207-218.

MESOZOIC MAGMATISM

Cawthorn R.G and Kruger F.J. (2004) Petrology and Ni-Cu-PGE potential of the Insizwa lobe, Mount Ayliff intrusion. *Canadian Mineralogist*, **42**, 303-324.

De Bruijn H. Schoch A.E., Fairwood D.S., Van Der Westhuizen W.A. (2005). The geology and petrochemistry of the Mashikiri Formation along the Olifants River Section, Kruger National Park, South Africa. *S. Afr. J. Geol.*, **108**, 173-186.

Ewart A, Marsh J.S., Milner S.C., Duncan A.R., Kamber B.S. and Armstrong R.A. (2004). Petrology and geochemistry of Early Cretaceous bimodal continental flood volcanism of NW Etendeka, Namibia. Part I: Introduction, mafic lavas and re-evaluation of mantle source components. *J. Petrol.*, **45**, 59-105.

Ewart A, Marsh J.S., Milner S.C., Duncan A.R., Kamber B.S. and Armstrong R.A. (2004). Petrology and geochemistry of Early Cretaceous bimodal continental flood volcanism of NW Etendeka, Namibia. Part 2: Characteristics and petrogenesis of the high-Ti latite and high-Ti

and low-Ti voluminous quartz latite eruptives. *J. Petrol.*, **45**, 107-138.

Jourdan F., Féraud, G., Bertrand, H., Kampunzu, A.B., Tshoso, G., Watkeys, M. K. and Le Gall, B. (2005). The Karoo large igneous province: Brevity, origin, and relation with mass extinction questioned by new $^{40}\text{Ar}/^{39}\text{Ar}$ age data. *Geology*, **33**, 745-748.

Jourdan F., Féraud G., Bertrand H., Watkeys M.K., Kampunzu A.B. and Le Gall B. (2006). Basement control on dyke distribution in Large Igneous Provinces: Case study of the Karoo triple junction. *Earth Planet. Sci. Lett.*, **241**, 307-322.

Marsh J.S., Swart R.S. and Phillips D. (2003). Implications of a new $^{40}\text{Ar}/^{39}\text{Ar}$ age for a basalt flow interbedded with the Etjo Formation, northeast Namibia. *S. Afr. J. Geol.*, **106**, 281-286.

Marsh J.S., Allen P. and Fenner, N (2003). The geochemical structure of the Insizwa lobe of the Mount Ayliff complex with implications for the emplacement and evolution of the complex and its Ni-sulphide potential. *S. Afr. J. Geol.*, **106**, 409-428.

Marsh J.S. (2004). Rare Earth Element geochemistry of the Insizwa Lobe of the Mount Ayliff Complex, Eastern Cape, South Africa. *S. Afr. J. Sci.*, **100**, 556-560.

Miller J.A. and Harris C. (2006)in press. Petrogenesis of the Swaziland and northern Natal rhyolites of the Lebombo rifted volcanic margin, south east Africa. *J. Petrol.*, **48**, 185-218.

Riley, T.R., Millar, L., Watkeys, M.K., Curtis, M.L., Leat, P.T., Klausen, M.B. and Fanning, C.M. (2004). U-Pb zircon (SHRIMP) ages for the Lebombo rhyolites, South Africa: refining the duration of Karoo volcanism. *J. Geol. Soc.*, **161**, 547-550.

Riley T.R, Curtis M.L, Leat P.T, Watkeys M.K., Duncan R.A, Millar, I.L. and Owens W.H. (2006) Overlap of Karoo and Ferrar Magma Types in KwaZulu-Natal, South Africa. *J. Petrol.*, **47**, 567-593.

Svensen H., jamtveit B., Planke S. and Chevallier L. (2006). Structure and evolution of hydrothermal vent complexes in the Karoo Basin, South Africa. *J. Geol. Soc.*, **163**, 671-682.

Trumbull R.B., Harris C., Frindt S. and Wigand W (2004). Oxygen and neodymium isotope evidence for source diversity in Cretaceous anorogenic granites from Namibia and implications for A-type granite genesis. *Lithos*, **73**, 21-40.

KIMBERLITE AND MANTLE MATERIALS

Appleyard C.M., Viljoen K.S. and Dobbe R. (2004). A study of eclogitic diamonds and their inclusions from Finsch kimberlite pipe, South Africa. *Lithos*, **77**, 317-332.

Barnett W. (2004). Subsidence breccias in kimberlite pipes - an application of fractal analysis. *Lithos*, **76**, 299-316.

Barton J.M. and Gerya T.V. (2003). Mylonization and decomposition of garnet: Evidence for

rapid deformation and entrainment of mantle-garnet-harzburgite by kimberlite magma, K1 Pipe, Venetai nine, South Africa, *S. Afr. J. Geol.*, **106**, 231-246.

Basson I.J. and Viola G. (2003). Structural overview of selected Group II kimberlite dyke arrays in South Africa: implications for kimberlite emplacement mechanisms. *S. Afr. J. Geol.*, **106**, 375-394.

Basson I.J. and Viola G. (2004). Passive kimberlite intrusion into actively dilating dyke-fracture arrays: evidence from fibrous calcite veins and extensional fracture cleavage. *Lithos*, **76**, 283-297.

Becker M. and Le Roex, A.P. (2005). Geochemistry of South African On- and Off-craton, Group I and Group II kimberlites: Petrogenesis and source region evolution. *J. Petrol.*, **47**, 673-703.

Bell D.R. and Moore R.O. (2004). Deep chemical structure of the southern African mantle from kimberlite megacrysts. *S. Afr. J. Geol.*, **107**, 59-80.

Burgess R., Kiviets G.B. and Harris J.W. (2004). Ar-Ar age determinations of eclogitic clinopyroxene and garnet inclusions in diamonds from the Venetia and Orapa kimberlites. *Lithos*, **77**, 113-124.

De Bruin D. (2005). Multiple compositional megacryst groups from the Uintjiesberg and Witberg kimberlites, South Africa. *S. Afr. J. Geol.*, **108**, 233-246.

Dludla S., Le Roex A.P. and Gurney J.J. (2006). Eclogitic xenoliths from the premier kimberlite, South Africa: geochemical evidence for a subduction origin. *S. Afr. J. Geol.*, **109**, 353-368.

Doyle P.M., Bell D.R. and Le Roex A.P. (2004). Fine-grained pyroxenites from the Gansfontein kimberlite, South Africa: Evidence for a megacryst magma - mantle interaction. *S. Afr. J. Geol.*, **107**, 285-300.

Grégoire M., Bell D.R. and Le Roex A.P. (2003). Garnet lherzolites from the Kaapvaal Craton (South Africa): trace element evidence for a metasomatic history. *J. Petrol.*, **44**, 629-657.

Grégoire M., Tinguely C., Bell D.R. and Le Roex A.P. (2005). Spinel lherzolite xenoliths from the Premier kimberlite (Kaapvaal craton, South Africa): Nature and evolution of the shallow upper mantle beneath the Bushveld complex. *Lithos*, **84**, 185-205.

Grütter H.S., Gurney J.J., Menzies A.H. and Winter F. (2004). An updated classification scheme for mantle-derived garnet for use by diamond explorers. *Lithos*, **77**, 841-857.

Harris M., Le Roex A., and Class C. (2004). Geochemistry of the Uintjiesberg kimberlite, South Africa: petrogenesis of an off-craton, group I, kimberlite. *Lithos*, **74**, 149-165.

Hetman C.M., Scott Smith B.H., Paul J.L. and Winter F. (2004). Geology of the Gahcho Kué kimberlite pipes, NWT, Canada: root to diatreme magmatic transition zones. *Lithos*, **76**, 51-74.

Jelsma H.A., De Wit M.J., Thiarth C., Dirks P.H.G.M., Viola G., Basson I.J. and Ancker E. (2004). Preferential distribution along transcontinental corridors of kimberlites and related rocks of Southern Africa. *S. Afr. J. Geol.*, **107**, 301-324.

Kurszlauskis S. and Barnett W.P. (2003). Volcanological and structural aspects of the Venetia kimberlite cluster - a case study of South African kimberlite maar-diatreme volcanoes. *S. Afr. J. Geol.*, **106**, 165-192.

Le Roex A.P., Bell D.R. and Davis P. (2003) Petrogenesis of Group I kimberlites from Kimberley, South Africa: evidence from bulk-rock geochemistry. *J. Petrol.*, **44**, 2261-2286.

Maier W.D., Peltonen P., Juvonen R. and Pienaar C. (2005) Platinum-group elements in peridotite xenoliths and kimberlite from the Premier kimberlite pipe, South Africa. *S. Afr. J. Geol.*, **108**, 413-428.

McKenna N., Gurney J.J., Klump J. and Davidson J.M. (2004). Aspects of diamond mineralization and distribution at the Helam mine, South Africa. *Lithos*, **77**, 193-208.

Menzies A., Westerlund K., Grütter H., Gurney J., Carlson J., Fung A. and Nowicki T. (2004). Peridotitic mantle xenoliths from kimberlites on the Ekatia Diamond Mine property, N.W.T., Canada: major element compositions and implications for the lithosphere beneath the central Slave craton. *Lithos*, **77**, 395-412.

Naidoo P., Stiefenhofer J., Field M. and Dobbe R. (2004). Recent advances in the geology of Koffiefontein mine, Free State Province, South Africa. *Lithos*, **76**, 161-182.

Nowell G.M., Pearson D.G., Bell D.R., Carlson R.W., Smith C.B., Kempton P.D. and Noble S.R. (2004). Hf Isotope Systematics of Kimberlites and their Megacrysts: New Constraints on their Source Regions. *J. Petrol.*, **45**, 1583-1612.

Phillips D., Harris J.W. and Viljoen K.S. (2004). Mineral chemistry and thermobarometry of inclusions from De Beers Pool diamonds, Kimberley, South Africa. *Lithos*, **77**, 155-179.

Pretorius, W. and Barton J.M. (2003). Petrology and geochemistry of crustal and upper mantle xenoliths from the Venetia diamond mine - evidence for Archaean crustal growth and subduction. *S. Afr. J. Geol.*, **106**, 213-230.

Richardson S.H., Shirey S.B. and Harris J.W. (2004). Episodic diamond genesis at Jwaneng, Botswana and implications for Kaapvaal craton evolution. *Lithos*, **77**, 143-154.

Shirey S.B., Richardson S.H. and Harris J.W. (2004). Age, paragenesis and composition of diamonds and evolution of the Precambrian mantle lithosphere of southern Africa. *S. Afr. J. Geol.*, **107**, 91-106.

Shirey S.B., Richardson S.H. and Harris J.W. (2004). Integrated models of diamond formation and craton evolution. *Lithos*, **77**, 923-944.

Shirey S.B., Harris J.W., Richardson S.H., Fouch M., James D.E., Cartigny P., Deines P. and Viljoen K.S. (2003). Regional patterns in the paragenesis and age of inclusions in diamond, diamond composition, and the lithospheric seismic structure of Southern Africa. *Lithos*, **71**,

Skinner E.M.W and Marsh J.S. (2004). Distinct kimberlite pipe classes with contrasting eruption processes. *Lithos*, **76**, 183-200.

Skinner E.M.W., Apter D.B., Morelli C. and Smithson N.K. (2004). Kimberlites of the Man craton, West Africa. *Lithos*, **76**, 233-259.

Smith C.B., Sims K., Chimuka L., Duffin A., Beard A.D. and Townend R. (2004) Kimberlite metasomatism at Murowa and Sese pipes, Zimbabwe. *Lithos*, **76**, 219-232.

Stachel T., Aulbach S., Brey G.P., Harris J.W., Leost I., Tappert R. and Viljoen, K.S. (2004) The trace element composition of silicate inclusions in diamonds: a review. *Lithos*, **77**, 1-19.

Stiefenhofer J. and Farrow D.J. (2004). Geology of the Mwadui kimberlite, Shinyanga district, Tanzania. *Lithos*, **76**, 139-160.

Viljoen K.S., Schulze D.J. and Quadling A.G (2005). Contrasting Group I and Group II eclogite xenolith petrogenesis: petrological, trace element and isotopic evidence from Eclogite, garnet websterite and alkremite xenoliths in the Kaalvlei kimberlite, South Africa. *J. Petrol.*, **46**, 2059-2090.

Viljoen K.S., Dobbe R., Smit B., Thomassot E. and Cartigny P. (2004). Petrology and geochemistry of a diamondiferous lherzolite from the Premier diamond mine, South Africa. *Lithos*, **77**, 539-552.

Westerlund K.J. and Gurney J.J. (2004). Silicate and oxide inclusions characteristics and infra red absorption analysis of diamonds from the Klipspringer kimberlites, South Africa. *S. Afr. J. Geol.*, **107**, 131-146.

Westerlund K.J., Gurney J.J., Carlson R.W., Shirey S.B., Hauri E.H. and Richardson S.H. (2004). A metasomatic origin for late Archaean eclogitic diamonds: Implications from internal morphology of diamonds and Re-Os and S isotope characteristics of their sulfide inclusions from the late Jurassic Klipspringer kimberlites. *S. Afr. J. Geol.*, **107**, 119-130.

Wyatt B.A., Baumgartner M., Anckar E. and Grutter H. (2004). Compositional classification of kimberlitic and non-kimberlitic ilmenite. *Lithos*, **77**, 819-840.

Zartman R.E. and Richardson S.H. (2005). Evidence from kimberlitic zircon for a decreasing mantle Th/U since the Archean. *Chem. Geol.*, **220**, 263-283.

MISCELLANEOUS

Barry T.L, Pearce J.A, Leat P.T., Millar I.L and Le Roex A.P (2006). Hf isotope evidence for selective mobility of high-field-strength elements in a subduction setting: South Sandwich Islands. *Earth Planet. Sci. Lett.*, **252**, 223-244.

Class C. and Le Roex A.P. (2006). Continental material in the shallow oceanic mantle - how does it get there? *Geology*, **34**, 129-132.

Janney P.E., Le Roex A.P. and Carlson R.W. (2005), hafnium isotope and trace element constraints on the nature of mantle heterogeneity beneath the central Southwest India Ridge (13°E to 47°E). *J. Petrol.*, **46**, 2427-2464.

Klausen M.B. (2004). Geometry and mode of emplacement of the Thverartindur cone sheet swarm, SE Iceland. *J. Volc. and Geothermal Res.* **138**, 185-204.

Klausen M.B. (2006). Geometry and mode of emplacement of dikes around the Birnudalstindur volcano, SE Iceland. *J. Volc. and Geothermal Res.* **151**, 340-356.

Maier W.D. and Barnes S-J. (2004). Pt/Pd and Pd/Ir ratios in mantle-derived magmas: a possible role for mantle metasomatism. *S. Afr. J. Geol.*, **107**, 333-340.

Maier W.D., Barnes S-J and Marsh, J.S. (2003). The concentration of the noble metals in Southern African flood-type basalts and MORB: implications for petrogenesis and magmatic sulphide exploration. *Contrib. Mineral. Petrol.*, **146**, 44-61.

Preston R.F., Stevens G. and McCarthy T.S. (2003). Fluid compositions in equilibrium with silica undersaturated magmas in the system Na₂O-Al₂O₃-SiO₂-H₂O: clues to the composition of fenetizing fluids. *Contrib. Mineral. Petrol.*, **144**, 539-548.

Roberts R.J., Torsvik T.H., Andersen T.B. and Rehnstrom E.F.(2003). The Early Carboniferous Megeroy dykes, northern Norway: Paleomagnetism and Paleogeography. *Geol. Mag.* **140**, 443-451.

Riishuus M.S, Peate D.W, Tegner C., Wilson J.R, Brooks C.K and Harris C. (2006). Temporal evolution of a long-lived syenitic centre: The Kangerlussuaq Alkaline Complex, East Greenland. *Lithos*, **92**, 276-299.

Zhong H., Yao Y., Prevec S.A, Wilson A.H., Viljoen M.J., Viljoen R.P., Liu B-G., and Luo Y-N. (2004). Trace-element and Sr—Nd isotopic geochemistry of the PGE-bearing Xinjie layered intrusion in SW China. *Chem. Geol.*, **203**, 237-252.

