

(Reductions contemplated: A, Abridged; ABS, Abstract; Ex, Extracted)

Pages

BOOKS

- 1969 *The Kiglapait Layered Intrusion, Labrador*. Geol. Soc. Amer. Memoir 112, 204 pp.
- 1972 (R.F. Emslie, S.A. Morse, E.P. Wheeler) *Igneous Rocks of Central Labrador, with Emphasis on Anorthosite*. XXIV Internat. Geol. Cong. Guidebook A54, Ottawa, Canada, 72pp.
- 1994 Berg, Emslie, Hamilton, Morse, Ryan, Wiebe: *Anorthositic, granitoid, and related rocks of the Nain Plutonic Suite*. International Geological Correlation Programme, IGCP Projects #290 and #315. **Contains age and isotopic data by M. A. Hamilton.** 2
- 1994Ex *Basalts and Phase Diagrams*. Corrected and reprinted by Krieger, Melbourne, FL, 493 pp. Chapter 13.

RESEARCH PAPERS Author: S. A. Morse unless otherwise noted. C = Commentary

1. 1973 **Speer, J. A. & Ribbe, P. H.** The feldspars of the Kiglapait intrusion, Labrador. *Am. J. Sci.* 273-A, 468-478. (Lasting heat source annealing ... adcumulus growth.) 11
 2. 1975C **Berg, J. H.** New stratigraphic sequence above the Snyder Group. In Morse, S. A., Ed., *Nain Anorthosite Project, Field Report 1974*, UMass Dept. G&G Contr. 17, 27-33. 7
- (Defines the Falls Brook Group of metasedimentary, metavolcanic, and ultramafic rocks, including banded iron formation and spinel peridotite. Recognition of this Group eliminates (most of) the Kiglapait Outer Border Zone.)
3. 1977 **Berg, J. H.** Regional geobarometry in the contact aureoles of the anorthositic Nain Complex, Labrador. *J. Petrology* 18, 399-430. 32
- (First ever pressure estimates for anorthosites, and the KI. Pressures later reduced by 2 kb; see Berg & Docks 1983, below.)
4. 1977 **Berg, J. H.** (1977) Dry granulite mineral assemblages in the contact aureole of the Nain Complex, Labrador. *Contributions Mineralogy Petrology* 64, 32-52. 21
 5. 1979a Kiglapait geochemistry I: Systematics, sampling, and density. *J. Petrology* 20, 555-590. (Contains maps of sampling traverses and an overall summary description of the intrusion.) 36
 6. 1979b Kiglapait geochemistry II: Petrography. *J. Petrology* 20, 591-624. 33
 7. 1979c **Huntington, H. D.** Kiglapait mineralogy I: Apatite, biotite, and volatiles. *J. Petrology* 20, 625-652. (H₂O 68 ppm!) 28
 8. 1979d **Stephenson, Randell and Thomas, M. D.** Three-dimensional gravity analysis of the Kiglapait layered intrusion, Labrador. *Canad. J. Earth Sci.* 16, 24-37. 14
 9. 1980 Kiglapait mineralogy II: Fe-Ti oxide minerals and the activities of oxygen and silica. *J. Petrology* 21, 685-719. 35
 10. 1981a Kiglapait geochemistry III: Potassium and rubidium. *Geochim. et Cosmochim. Acta* 45, 163-180. 18
 11. 1981b Kiglapait geochemistry IV: The major elements. *Ibid* 45, 461- 479. 19

12. 1982a Kiglapait geochemistry V: Strontium. *Geochim. et Cosmochim. Acta* **46**, 223-234. 12
13. 1982b **Speer, J. A.** Metamorphism of the pelitic rocks of the Snyder Group in the contact aureole of the Kiglapait layered intrusion: effects of buffering partial pressures of water. *Canad. J. Earth Sci.* **19**, 1888-1909. 22
14. 1983a **Berg, J. H. and Docka, J. A.** (1983). Geothermometry in the Kiglapait aureole, Labrador. *American Journal of Science* **283**, 414-434. 21
(Definitive treatment showing the Falls Brook Group as part of the contact aureole, with observed and calculated *T* gradients in agreement. Cites *P* = 2.2 kb but a review of all JHB comments suggests best estimate of pressure is 2.5 kb.)
15. 1983b Strontium isotope fractionation in the Kiglapait intrusion. *Science* **220**, 193-195. (Hairbrained idea but now conceivable in light of evidence for an internal reservoir in the magma chamber.) 3
16. 1983c **(S.A. Morse, I.M. Young & S.S. Ball)** Xenoliths in the Kiglapait intrusion. Nain Anorthosite Project, Field Report, UMass Dept. G&G Contr. **40**, 87-94. ocr 6
17. 1983d **Belkin, H. E.** Petrofabric analysis of selected rocks from the Kiglapait layered intrusion, Labrador (abs). *GSA Abstracts with Programs*, 1983, 524. (We have stereo plots and thin sections at UMass.) 1
18. 1983e **Young, I. M.** Observations on layering styles in the Kiglapait intrusion. Nain Anorthosite Project, Labrador: Field Report 1981. UMass Dept. G&G Contr. **40**, 105-112. ocr~ 6
(Most or all modal layering is lensoid, with max. length ~200 meters.)
19. 1984a **Kalamarides, R. I.** Kiglapait geochemistry VI: Oxygen isotopes. *Geochim. et Cosmochim. Acta* **48**, 1827-1836. (Oxygen isotope ratios those of normal mafic igneous rocks.) 10
20. 1984b **(S.A. Morse & K.M. Nolan)** Origin of strongly reversed rims on plagioclase in cumulates. *Earth & Planet. Sci. Lett.* **68**, 485- 498. 14
21. 1984c Cation diffusion in plagioclase feldspar. *Science* **225**, 504- 505. 2
22. 1985 **(S.A. Morse & K.M. Nolan)** Kiglapait geochemistry VII: Yttrium and the rare earth elements. *Geochim. et Cosmochim. Acta* **49**, 1621-1644. 24
23. 1985C **DePaolo, D. J.** Isotopic studies of processes in mafic magma chambers: I. The Kiglapait Intrusion, Labrador. *Journal of Petrology* **26**, 925-951. (Isotopes good; modeling disputed in Morse 1996.) 27
24. 1986a Thermal structure of crystallizing magma with two-phase convection. *Geol. Mag.* **123**, 205-214. (Examples from KI) 10
25. 1986b **Docka J. A., Berg J. H., & Klewin K.W.** Geothermometry in the Kiglapait aureole. II. Evaluation of exchange thermometry in a well-constrained thermal setting. *J. Petrol* **27**: 605-626. 22
26. 1986c **(K.M. Nolan & S.A. Morse)** Marginal rocks resembling the estimated bulk composition of the Kiglapait Intrusion. *Geochim. et Cosmochim. Acta* **50**, 2381-2386. 6
27. 1986d Convection in aid of adcumulus growth. *J. Petrology* **27**, 1183- 1215. 33
(Quantification of rates and scales from Kiglapait.)
28. 1986e **(S.A. Morse & J.P. Allison)** Correlation between roof and floor cumulates of the Kiglapait intrusion, Labrador. *Geophys. Res. Lett.* **13**, 1466-1469. 4

29. 1986fC **Kalamarides, R. I.** High-temperature oxygen isotope fractionation among the phases of the Kiglapait Intrusion, Labrador, Canada. *Chemical Geology* **58**, 303-310. 8
30. 1988 Motion of crystals, solute, and heat in layered intrusions. *Canad. Mineralogist* **26**, 209-224. 14
31. 1988ABS **Kerrick, D. M. & Speer, J. A.** The role of minor element solid solution in the andalusite-sillimanite equilibrium in metapelites and peraluminous granitoids. *Am. J. Sci.* 288, 152-192. (Discusses 300-m wide A+S isograd in Snyder Group of Kiglapait contact aureole. But Berg and Docka find a much wider occurrence of A+S; see 1983.) 2
32. 1989EX **Chaussidon, M., Albarède, F. & Sheppard, S. M. F.** Sulfur isotope variations in the mantle from ion microprobe analyses of micro sulfide inclusions. *Earth and Planetary Science Letters* 92, 144-156. ($\delta^{34}\text{S} = -1 \pm 1 \text{‰}$ for Kiglapait sulfides, hence meteoritic within uncertainty.) 2
33. 1989A,C **Langmuir, C. H.** Geochemical consequences of in situ crystallization. *Nature* 340, 199-205. 7
(Extensive discussion of Kiglapait; see Morse 1996 for another view.)
34. 1991A,C (**Morse, S. A., Rhodes, J. M., & Nolan, K. M.**) Redox effect on the partitioning of nickel in olivine. *Geochim. et Cosmochim. Acta* **55**, 2373-2378. 2
(Note: this effect has recently been shown by Chusi Li and Ed Ripley to be due to the presence of S in the melt.)
35. 1992 (**Yu, Yang and S. A. Morse**) Age and cooling history of the Kiglapait Intrusion from an $^{40}\text{Ar}/^{39}\text{Ar}$ study. *Geochim. et Cosmochim. Acta* **56**, 2471-2485. 15
36. 1996 Kiglapait mineralogy III: Olivine compositions and Rayleigh fractionation models. *J. Petrology* **37**, 1037-1061. 25
(Recognizes that summation liquids have X_{Mg} unlike the equilibrium liquids.)
37. 1997A **Blundy, J.D.** Experimental study of a Kiglapait marginal rock and implications for trace element partitioning in layered intrusions. *Chemical Geology* **141**, 73-92. 10
38. 2000 **Owens B.E.** High-temperature contact metamorphism of calc-silicate xenoliths in the Kiglapait Intrusion, Labrador. *Am Mineral* **85**: 1595-1605. 11
39. 2001 Augite-olivine equilibria in the Kiglapait Intrusion, Labrador, Canada. *Canadian Mineralogist* **39**, 267-274. 8
40. 2002A,C **Higgins, M. D.** A crystal size-distribution study of the Kiglapait layered mafic intrusion, Labrador, Canada: evidence for textural coarsening. *Contrib Mineral Petr* **144** (3): 314-330. 3
41. 2002A,C **Barmina G.S, Ariskin A.A.** Estimation of chemical and phase characteristics for the initial magma of the Kiglapait troctolite intrusion, Labrador, Canada. *Geochem Int+* **40** (10): 972-983. 3
42. 2004 **Morse, S.A. & Ross, M.** Kiglapait mineralogy IV: The augite series. *Am Mineral* 89, 1380-1395. 16
43. 2004 **Morse, S.A., Brady, J.B. & Sporleder, B.A.** Experimental petrology of the Kiglapait intrusion: cotectic trace for the Lower Zone at 5kb in graphite. *Journal of Petrology* **45**, 2225-2259. 35
44. 2006 Multiphase Rayleigh fractionation. *Chemical Geology* **226**, 212-231. (Examples

	from KI.)	20
45. 2006	Labrador massif anorthosites: Chasing the liquids and their sources. <i>Lithos</i> 89 , 202-221. doi:10.1016/j.lithos.2005.12.009. (Data and examples from KI.)	20
46. 2009	The internal reservoir of large magma chambers revealed by multiphase Rayleigh fractionation. In second draft 2008.	est 30
Total exclusive of Foreword & Introduction.		710

YET TO DO: Kiglapait feldspars I, II (plagioclase, then ternary feldspars)
 KI Upper Border Zone I, II (petrography, geochemistry)

DERIVATIVE OR COLLATERAL PAPERS, MOSTLY ON MAGMA DYNAMICS

- 1982b Adcumulus growth of anorthosite at the base of the lunar crust. *Proc. Lunar Planet. Sci. Conf. I, J. Geoph. Res.* **87S**, A10-A18. (Use of Kiglapait data and magma dynamics)
- 1986a A magmatic heat pump. *Nature* **324**, 658-659.
- 1986b Adcumulus growth of the inner core. *Geophys. Res. Lett.* **13**, 1557-1560.
- 1986c Origin of the earliest planetary crust: role of compositional convection. *Earth Planet. Sci. Lett.* **81**, 118-126.
- 1987 (**S.A. Morse, B.E. Owens, & A.R. Butcher**) Origin of finger structures in the Rhum Complex: phase equilibrium and heat effects. *Geol. Mag.* **124**, 205-210.
- 1990a On the differentiation of the Skaergaard intrusion: a discussion of Hunter & Sparks [Contributions to Mineralogy & Petrology 95:451-461], *Contributions to Mineralogy & Petrology* **104**, 240-244. (Comparisons to KI)
- 1990b (**Olson, K.E. & Morse, S. A.**) Regional Al-Fe magmas associated with anorthosite-bearing terranes. *Nature* **344**, 760-762. (Magmas similar to KI)
- 1991 Basaltic magma from the crust is not a free option. *EOS Trans. Am. Geophys. Union* **72**, 161.
- 1992 Partitioning of Sr between plagioclase and melt: a comment on Blundy and Wood. *Geochim. et Cosmochim. Acta* **56**, 1735-1737. (Example from KI)
- 1993 Behavior of a perched crystal layer in a magma ocean. *J. Geophysical Research (Planets)*, **98**, 5347-5353.
- 1998 Is the cumulate paradigm at risk?: An extended discussion of the cumulate paradigm reconsidered. *Jour. Geology* **106**, 367-370.
- 2000 (**Scoates, J. S. & Mitchell, J. N.**), 2000, The evolution of troctolitic and high-Al basaltic magmas in Proterozoic anorthosite plutonic suites and implications for the Voisey's Bay massive Ni-Cu sulfide deposit. *Economic Geology* **95**, 677-701.
- 2000 A double magmatic heat pump at the core-mantle boundary. *American Mineralogist* **85**, 1589-1594.
- 2001 Porous sediments at the top of the Earth's core? *Science* **291**, 2090-2091.
- 2002 No mushy zones in the Earth's core. *Geochim. et Cosmochim. Acta.* **66** (Yoder Issue), 2155-2165.
- 2007 Holness, M. B., Tegner, Christian, Nielsen, T. F. D., Stripp, Gemma, & Morse, S. A., (2007) A textural record of solidification and cooling in the Skaergaard Intrusion, East Greenland. *Journal of Petrology* **48**, 2359-2377.

- 2008 Morse, S. A. (2008) Toward a thermal model for the Skaergaard liquidus. *American Mineralogist* **93**, 248-251.
- 2008 Morse, S. A. (2008) Principles of applied experimental igneous petrology: A comment on "Experimental constraints on the Skaergaard liquid line of descent" by Thy, Leshar, Nielsen, and Brooks, 2006, *Lithos* 92: 154-180. *Lithos* 94: (in press).
- 2008 Morse, S. A. (2008) Compositional Convection Trumps Silicate Liquid Immiscibility in Layered Intrusions: A discussion of "Liquid immiscibility and the evolution of basaltic magma" by Veksler et al., *J. Pet.* 48, 2187-2210, 2007. *Journal of Petrology*, submitted Jan 08.

THESES (unless substantial portions published, as above)

- 1975 **Shirey, S.B.** Sulfides and sulfur content of the Kiglapait layered intrusion, Labrador. MS thesis, University of Massachusetts, 75 pp. (The definitive work, long overdue for publication.)
- 1981 **Schuh, M. L.** Geology of the Avakutakh Iron Formation, Labrador. MS Thesis, Northern Illinois University, DeKalb, 192 pp. (Further defines the Falls Brook Group, replacing the KI OBZ. Copy in Morr. Rm.12.)
- 1984 **Allison, J. P.** Petrography of the Upper Border Zone of the Kiglapait intrusion, Labrador. MS thesis, University of Massachusetts, 220 pp. (Vast amounts of interesting data. Lacks whole-rock chemistry.)
- 1984a **Ball, S. S.,** The Partridge Point area of the Kiglapait layered intrusion. MS thesis, UMass, 98 pp. (Describes xenoliths.)
- 1986 **Owens, B. E.** Xenoliths and autoliths in the Kiglapait intrusion, Labrador. MS thesis, UMass, 149 pp. (Probe analyses and remarkable conclusions about volatile retention and settling velocities & residence times. Much published in 2000, above.)
- 1993 **Hamilton, M. A.** Contamination of massif anorthosite and Precambrian crustal evolution in central Labrador: A combined trace element and Sr, Nd, and Pb isotope study. PhD thesis, University of Massachusetts, 195 pp. (Treats country rocks of the KI and Nain Plutonic Series; a terrific regional overview.)
- 1998 **Sporleder, B. A.** Liquid line of descent of the lower zone of the Kiglapait layered intrusion, Labrador, Canada: An experimental study. MS thesis, University of Massachusetts, 92 pp.
- 2000 **Peterson, A. L.** Quest for the liquid line of descent of the Upper Zone of the Kiglapait intrusion, Labrador, Canada: an experimental study. MS thesis, University of Massachusetts, 80 pp.
- 2008 **McIntosh, D. C. B.** An experimental study exploring the magmatic source region of the Kiglapait layered intrusion, Labrador, Canada. (Will either be summarized in comments above or written up as a paper for publication.)

ELECTRONIC DATABASE

- 2002 **Kilfoil, G. J.** (Chief compiler) A digital atlas of merged magnetic data from existing airborne surveys, Labrador. Open File Lab/1370-version 1.0, October 2002. Geological Survey, Dept. of Mines & Energy, Government of Newfoundland & Labrador, <http://www.gov.nl.ca/mines&en/>. Single CD. Contains aeromag map of Kiglapait and Hettasch Intrusions.

ABSTRACTS not listed, except:

- 2004 Weis, Dominique, Morse, S. A., and Scoates, J. S. (2004) Mineral-Scale and Regional Isotopic Heterogeneity within the Kiglapait Intrusion and Other Mafic Intrusions of the ca. 1.3 Ga Nain Plutonic Suite, Labrador. *EOS Trans. Am. Geophys. Union* 85(17), JA514, Abstr. V52A-02.