References

Aires-Barros, L., Graça, R. C., and Velez, A. (1975): Dry and wet laboratory tests and thermal fatigue of rocks. *Engineering Geology*, **9**, 249-265.

Akagi, K. and Koike, K. (1978): Reexamination of formative process of Nasuno-ga-hara alluvial fan. *Proceedings of Geographical Review of Japan*, No.16, 256-257.

Akutsu, J. (1962): The Quaternary geology of the Nasuno-ga-hara plain, Tochigi prefecture. *Science Report of Utsunomiya University*, No. 12, 73-92.

Alexander, E. B. (1985): Rates of soil formation from bedrock or consolidated sediments. *Physical Geography*, **6**. 23-42.

Amit, R., Gerson, R. and Yaalon, D. H. (1993): Stages and rate of the gravel shattering process by salts in desert Reg soil. *Geoderma*, **57**, 295-324.

Anderson, L. W. and Anderson, D. S. (1981): Weathering rinds on quartzarenite clasts as a relative-age indicator and the glacial chronology of Mount Timpanogos, Wasatch range, Utah. *Arctic and Alpine Research*, **13**, 25-31.

Aoki, T. (1994): Chronological Study of glacial advances based on the weathering-rind thickness of morainic gravel in the northern part of the Central Japan Alps. *Geographical Review of Japan*. **64A**, 601-618 (in Japanese with English abstract).

Berner, R. A., Sjoverg, M. A. Velvel, and Krom, M. D. (1980); Dissolution of pyroxenes and amphiboles during weathering, *Science*, **207**, 1205-1206.

Birkeland, P. W. (1973): Use of relative age-dating methods in a stratigraphic study of rock glacier deposits, Mt. Sopris, Colorado. *Arctic Alpine Res.*, **5**. 401-416.

Burke, R. M. and Birkeland, P. W. (1979): Reevaluation of multiparameter relative dating techniques and their application to the glacial sequence along the eastern escarpment of the Sierra Nevada, California. *Quaternary*

Res., **11**, 21-51.

Caine, N. (1983): *The Mountains of Northern Tasmania.* A. A. Balkema, Rotterdam, 200p.

Cernohouz, J. and Šolc, (1966): Use of sandstone wanes and weathered basaltic crust in absolute chronology. *Nature*, **212**, 806-807.

Chesworth, W., Dejou, J. and Larroque, P. (1981): The weathering of basalt and relative mobility of the major elements at Belbex France. *Geochemi. Chosmohimi. Acta.* **45**, 1235-1243.

Chigira, M. (1990) A mechanism of chemical weathering of mudstone in a mountain area. *Engineering Geology*, **29**, 119-138.

Chigira, M. (1991) Chemical weathering mechanisms and their effects on engineering properties of soft sandstone and conglomerate cemented by zeolite in a mountainous area. *Engineering Geology*, **30**, 195-219.

Chinn, T. J. H. (1981): Use of rock weathering–rind thickness for Holocene absolute age-dating in New Zealand. *Arctic and Alpine Research*, **13**, 33-45.

Colman, S. M. (1981a): Chemical weathering of basalts and andesites: Evidence from weathering rinds. *U. S. Geological Survey Professional Paper.* **1246**.

Colman, S. M. (1981b): Rock-weathering rates as functions of time. *Quaternary Research*, **15**. 250-264.

Colman, S. M. (1982): Clay mineralogy of weathering rinds and possible implications concerning the sources of clay minerals in soils. *Geology*, **10**. 370-375.

Colman, S. M. and Pierce, K. L. (1981): Weathering rinds on andesitic and basaltic stones as a Quaternary age indicator, western United States. *U. S. Geological Survey Professional Paper*, **1210**.

Cooke, R. U. and Smalley, I. J. (1968): Salt weathering in deserts. *Nature*, **220**, 1227-1227.

Crabtree, R. W. and Trudgill, S. T. (1985): Chemical denudation on a

magnesian limestone hillslope, field evidence and implications for modeling. *Earth Surface Processes and Landforms*, **10**, 331-341.

Craig, D. C. and Loughnan, F. C. (1969): Chemical and mineralogical transformation accompanying the weathering of basic volcanic rocks from New South Wales. *Australian Jour. Soil Res.*, **2**, 218-234.

Crook, R. Jr. and Gillespie, A. R. (1986): Weathering rates in granitic boulders measured by P-wave speeds. *In* Colman, S. M. and Dethier, D. P. *eds.*, *Rates of chemical weathering of rocks and minerals*. Academic Press, Orlando, 603p.

Deere, D. U. and Patton, F. D. (1971): Slope stability in residual soils. *Proc. 4th Pan-American Conf. On Soil Mech. And Found. Engng.*, Puerto Rico, 87-170.

Drever, J. I. (1997): *The Geochemistry of Natural Waters: Surface and Groundwater Environments-3rd ed.* Prentice-Hall, Inc., New Jersey. 436p.

Eggleton, R. A., Foudoulis, C. and Varkevisser, D. (1987): Weathering of basalt: Changes in chemistry and mineralogy. *Clay and Clay Miner.*, **35**, 161-169.

Garrels, R. M. and Mckenzie, F. T. (1967): Origin of the chemical compositions of some springs and lakes. In Stumm, W. *ed. Equilibrium Concepts in Natural Water Systems*. Advance in chemical series, 67, American Chemical Society. 222-242.

Gary, M., McAfee, Jr. R., and Wolf, D. *eds.* (1972): *Glossary of Geology*. American Geological Institute, 805p, Washington D. C.

Goudie, A., Atkinson, B. W., Gregory, K. J., Simmons, I. G., Stoddart, D. R., and Sugden, D. *eds.* (1985): *The Encyclopedic Dictionary of Physical Geography*. Blackwell, 611p, Oxford.

Grandstaff, D. E. (1986): The dissolution rate of forsteritic olivine from Hawaiian beach sand. In Colman, S. M. and Dethier, D. P. *eds.*, *Rates of Chemical Weathering of Rocks and Minerals*. Academic Press, Orlando, 603p

Friedman, I. and Long, W. (1976): Hydration rate of obsidian. *Science*, **191**, 347-352.

Friedman, I. and Smith, R. L. (1960): A new dating method using obsidian: part I, the development of the method. *Amer. Artiq.*, **25**, 476-493.

Haantjens, H. A. and Bleeker, P. (1970): Tropical weathering in the Territory of Pupua and New Guinea. *Aust. Jour. Soil Res.*, **8**, 157-177.

Harrassowitz, H. (1926): Laterit. Material und Versuch erdgeschichtlicher Auswertung. *Forschr. Geolog. Und Paleont*, **4**. 253-566.

Hay, R. L. (1960): Rates of clay formation and mineral alteration in a 4000-year-old volcanic ash soil on St. Vincent, B. W. I. *Amer. Jour. Sciences*, **258**, 354-368.

High, C. and Hanna, F. K. (1970): A method for the direct measurement of erosion on rock surfaces: *British Geomorphological Research Group, Technical Bulletin*, **5**, 25p.

Hirose, T. Hatta, T. and Matsukura, Y. (1995): Dissolution rates of several plutonic rocks and limestone in closed- and batch-system experiments. *Trans. Japanese. Geomorph. Union*, **16**, 43-51 (in Japanese with English abstract). (1995):

Hirose, T., Onda, Y. and Matsukura, Y. (1994): Runoff and solute characteristics in four small chatchments with different bedrocks in the Abukuma Mountains, Japan. *Trans. Japanese. Geomorph. Union*, **15A**, 31-48.

Hunt R. W. G. (1980): Colour term, symbols, and their usage. *In* Grum, F. and Bartleson, C. J. *eds. Optical Radiation Measurement*. 11-31, Academic Press, New York.

Hunt G. R. and Ashley, R. P. (1979): Spectra of altered rocks in visible and near infrared. *Economic Geology*. **74**, 1613-1629.

Hutchison, C. S. (1974): *Laboratory Handbook of Petrographic Techniques*. John Wiley & Sons, New York, 527p.

Ichikuni, M. (1972): *Inorganic Geochemistry*, Baihuukan, Tokyo, 148p (in

Japanese).

Katsui, Y. and Kondo, Y. (1965): Dating of stone implements by using hydration layer of obsidian. *Japanese Journal of Geology and Geography*, **36**, 45-60.

Kimiya, K. (1975a):Tensile strength as a physical scale of weathering in granitic rocks. *Journal of Geology of Japan*, **81**, 319-364 (in Japanese with English abstract).

Kimiya, K. (1975b): Rates of weathering of gravel of granitic rocks in Mikawa and Tomikusa areas. *Journal of Geology of Japan*, **81**, 683-696 (in Japanese with English abstract).

Knuepfer, P. L. K. (1988): Estimating ages of late Quaternary stream terraces from analysis of weathering rinds and soils. *Geological Society of America Bulletin*, **100**, 1224-1236.

Koike, K. (1961): Geomorphological developments of the drainage basin of the Naka River. *Geographical Review of Japan*, **34A**, 498-513 (in Japanese with English abstract).

Koike, K., Iwasaki, T., Danbara, T. and Momose, M. (1985): Fission-Track Ages and their geological meanings of Quaternary volcanic ashes (Shimotsuke-loam) covering the Kitsuregawa Hills, Tochigi Prefecture, Central Japan. *Komazawa Journal of Geography*, No. 21, 39-67 (in Japanese).

Koizumi, T. and Aoyagi, S. (1993): Debris supply periods estimated from weathering-rind thickness in rubble on the west-facing slope of Mt. Yakushidake, the Northern Japanese Alps. *Geographical Review of Japan*, **66A**, 269-286 (in Japanese with English abstract).

Koizumi, T. and Seki, H. (1992): Use of rock weathering-rind thickness to redate fossil periglacial slope in Mt. Kisokomagatake, the Central Japanese Alps. *Quaternary Journal of Geography*, **44**, 245-251 (in Japanese with English abstract).

Kuchitsu, N. (1990): Weathering of stone implements excavated from

Sunadadai Site, Kanagawa Prefecture — Taphonomy for archeological properties —. *Quaternary Research (Japan)*, **30**, 43-47 (in Japanese).

Lasaga, A. C. (1984): Chemical kinetics of water-rock interaction. *Journal of Geophysical Research*, **89**, 4009-4025.

Leneuf, N. and Aubert, G. (1960): Essai d'evaluation de la vitesse de ferrallitisation. *Proc. 7th Int. Conf. Soil Sci.*, 225-228.

Lumb, P. (1962): The properties of decomposed granite. *Geotechnique*, **12**, 226-243.

McGreevy, J. P. and Smith, B. J. (1982): Salt weathering in hot deserts: Observations on the design of simulation experiments. *Geografiska Annaler*, **64A**. 161-170

McGreevy, J. P. and Smith, B. J. (1984): The possible role of clay minerals in salt weathering, *Catena*, **11**, 169-175.

Machida, H. and Arai, F. (1979): Daisen Kurayoshi pumice: Stratigraphy, chronology, distribution and implication to late Pleistocene events in central Japan. *Journal of Geography*, **88**, 313-330 (in Japanese with English abstract).

Machida, H. and Arai, F. (1992): *Atlas of Tephra in and around Japan*. Tokyo Univ. Press, Tokyo, 276p (in Japanese).

Maruyama, A. (1981): Weathering rinds. *In* Machida *et al., eds. The Encyclopedia of Geomorphology*. Ninomiya-shoten, Tokyo, 767p (in Japanese).

Matsukura, Y. (1994): A review of the studies on rock control in weathering processes. *Trans. Japanese. Geomorph. Union*, **15**, 203-222 (in Japanese with English abstract).

Matsukura, Y. and Yatsu, E. (1982): Wet-dry slaking of Tertiary shale and tuff. *Trans. Japanese. Geomorph. Union*, **3**, 25-39 (in Japanese with English abstract).

Matsukura, Y., Kimata, M. and Yokoyama, S. (1994a): Formation of weathering rinds on andesite blocks under the influence of volcanic gasses

around the active crater of Aso Volcano, Japan. In Robinson, D. A. and Williams, R. B. G. *eds. Rock weathering and landform evolution*, 89-98, John Wiley & Sons, Chichester.

Matsukura, Y. Oguchi, C. T. and Hatta, T. (1994b): Preliminary study on Vickers microhardness of weathering rinds. *Annual Report of the Institute of Geoscience, the University of Tsukuba.* No. 20, 15-17. Menard, H. W. (1974): *Geology, resources and society.* W. H. Freeman, San Francisco, 621p.

Matsukura, Y. Maekado, A. Hatta, T. and Yatsu, E. (1983): Vertical changes in mineralogical, physical chemical and mechanical properties due to deep weathering of Inada granitic rocks, *Trans. Japanese. Geomorph. Union*, **4**, 65-80 (in Japanese with English abstract).

Menard, H. W. (1974): *Geology, Resources and Society*: W. H. Freeman, San Francisco, 621p.

Nahon, D. and Lappartient, J. R. (1977): Time factor and geochemistry in iron crust genesis. *Catena*, **4**, 249-254.

Nakada, S. (1987): X-ray fluorescence determination of trace elements in silicate rocks. *Sci. Rep. Geol. Kyusyu Univ.*, **15**, 37-44 (in Japanese with English abstract).

Nakada, S. Yanagi, T. Maeda, S. Fang, D and Yamaguchi, M. (1985): X-ray fluorescence analysis of major elements in silicate rocks. *Sci. Rep. Geol. Kyusyu Univ.*, **14**, 103-115 (in Japanese with English abstract).

Nakhla, F. M. (1956): *Economic Geology*. **51**, 811-827.

Nakashima, S.,Miyagi, I., Nakata, E., Sasaki, H., Nittono, S., Hirano, T., Sato, T. and Hayashi, H. (1992): Colour measurement of some natural and synthetic minerals. *Report of Research Institute of Natural Resources, Mining College, Akita University.* **57**, 57-76.

Nesbitt, H. W. and Young, G. M. (1982): Early proterozoic climates and plate motions inferred from major element chemistry of lutites. *Nature*, **299**, 715-717.

Nishiyama, K., Yokota, S. and Iwamatsu, A. (submitted): Reddish weathering of gravels within the Quaternary fan deposits and mutual relations among colour index and their physical properties. *Engineering Geol. (Japan)*. (in Japanese with English abstract).

Oguchi, C. T. and Matsukura, Y. (1996): The changes in Micro structure of porous rhyolite due to weathering and its influence on the reduction of rock strength. *Trans. Japanese. Geomorph. Union*, **17**, 1-15 (in Japanese with English abstract).

Oguchi, C. T., Hatta, T. and Matsukura, Y. (1994): Changes in rock properties of porous rhyolite through 40,000 years in Kozu-shima Island, Japan. *Geographical Review of Japan*, **67A**, 775-793 (in Japanese with English abstract).

Oguchi, C. T., Isobe, H., Komuro, K. and Matsukura, Y. (1995): Colour measurements using a visible microspectrometer of weathering rinds on andesite blocks. *Annual Report of the Institute of Geoscience, the University of Tsukuba*. No. 21, 9-13.

Porter, S. C. (1975): Weathering rinds as a relative-age criterion: Application to subdivision of glacial deposits in the Cascade Range. *Geology*, **3**, 101-104.

Reiche, P. (1943): Graphic representation of chemical weathering. *Jour. Sed. Petrology*, **13**, 58-68.

Ruxton, B. F. (1968): Measures of the degree of chemical weathering of rocks. *Jour. Geol.*, **76**, 518-527.

Saito, T., Abe, M. and Kunori, S. (1974): Study on weathering of volcanic rocks (I). *Butsuri-Tanko (Geophysical exploration)*, **27**, 3-15.

Sasaki, M., Ajisaka, T. and Okamoto, A. (1958): Hydrogeology of the Nasu plain, Tochigi prefecture. *Journal of Geography*. **67**, 59-73 (in Japanese with English abstract).

Selby, M. J. (1993): *Hillslope Materials and Processes, 2nd ed.* Oxford Univ. Press, New York, 451p.

Shiraiwa, T. and Watanabe, T. (1991): Late Quaternary glacial fluctuations in the Langtang Valley, Nepal Himalaya, reconstructed by relative dating methods. *Arctic and Alpine Research*, **23**, 404-416.

Singer, (1984): Clay formation in saprolites of igneous rocks under semiarid to arid conditions, Negev, Souther Israel. *Soil Sci.*, **137**, 332-240.

Strahler, A. H. and Strahler, A. N. (1978): *Modern Physical Geography*. John Wiley & Sons, New York, 638p.

Sugisaki, R., Shimomura, T. and Kazuo, A. (1977): An automatic X-ray fluorescence method for the analysis of silicate rocks. *Jour. Geol. Soc. Japan*, **83**, 725-733 (in Japanese with English abstract).

Sugisaki, R. Kinoshita, Shimomura, T. and Ando, K. (1981): An automatic X-ray fluorescence method for the trace element analysis in silicate rocks. *Jour. Geol. Soc. Japan*, **87**, 675-688 (in Japanese with English abstract).

Suzuki, M.(1976): *Kako wo Saguru Kagaku (Research of the Past Time)*. Kodansha, 234p (in Japanese).

Suzuki, Takasuke and Hachinohe, S. (1995): Weathering rates of bedrock forming marine terraces in Boso peninsula, Japan. *Trans. Japanese. Geomorph. Union*, **16**, 93-113.

Suzuki, Takasuke and Matsukura, Y. (1992): Pore-size distribution of loess from the Loess Plateau, China. *Trans. Japan. Geomorph. Union*. **13**, 169-183.

Suzuki, Takasuke, Hirano, M. Takahashi, K. and Yatsu, E. (1977): The interaction between the weathering processes of granites and the evolution of landform in the Rokko Mountains, Japan. — Part 1. Vertical changes in physical, mechanical, mineral and chemical properties of the weathered Rokko granite. *Bull. Fac. Sci. Eng., Chuo Univ.*, **20**, 343-389 (in Japanese with English abstract).

Suzuki, Takehiko (1992): Stratigraphy of tephra layers from the latter half of middle Pleistocene to late Pleistocene in the Chubu-Kanto area, Central Japan. *Geographical Reports of Tokyo Metropolitan University*. No. 27,

29-53.

Suzuki, Takehiko and Hayakawa, Y. (1990): The age and stratigraphic horizon of the Omachi Apm Tephra Beds, Middle Pleistocene Time-markers in Central Japan. *The Quaternary Research (Japan)*, **29**, 105-120 (in Japanese with English abstract).

Takaya, Y., Hatta, T. and Matsukura, Y. (1996): The influence of physical properties of sedimentary and igneous rocks on dissolution in closed-system experiments. *Trans. Japan. Geomorph. Union.* **17**, 193-202 (in Japanese with English abstract).

Tamari, Y., Tsuji, H. and Kusakabe, Y. (1988): The relationships between rock types and water. *Journal of Geochemical Research (Japan).* **22**, 139-147.

Tharp, T. M. (1987): Conditions for crack propagation by frost wedging. *Geological Society of America Bulletin*, **99**, 94-102..

Trendall, A. F. (1962): The formation of apparent peneplains by a process of combined laterization and surface work. *Zeitschrift für Geomorphologie N. F., Suppl. Bd*, **6**, 183-197.

Trudgill, S. T. (1975): Measurement of erosional weight-loss of rock tablets. *British Geomorphological Research Group, Technical Bulletin*, **17**, 13-19.

Trudgill, S. T. (1976): The subaerial and subsoil erosion of limestone on Aldabra Atoll, Indian Ocean. *Zeitschrift für Geomorphologie N. F., Suppl. Bd.*, **26**, 201-210.

Trudgill, S. T., High, C. J. and Hanna, F. K. (1981): Improvements to the micro-erosion meter. *British Geomorphological Research Group, Technical Bulletin*, **29**, 3-17.

Wakatsuki, T. and Rasyidin, A. (1992): Rates of weathering and soil formation. *Geoderma*, **52**, 251-263.

Waragai, T. (1993): Weathering process of andesite lava in Mt. Hachimen, Yabakei, Oita prefecture. *Bull. Fac. Science and. literature, Nihon Univ.*, **28**, 15-24 (in Japanese with English abstract).

Washburn, E. W. (1921): Note on the method of determining the distribution of pore size in a porous material. *Proc. National Academy Science*, **7**, 115-116.

Watanabe, K. and Sagehashi, N. (1960): Geologic history of the Nasu Plain, Tochigi Prefecture (Hydrology of Nasuno-ga-hara No.3). *Journal of Geology of Japan*, **66**, 147-156 (in Japanese with English abstract).

Waylen, M. J. (1979): Chemical weathering in a drainage basin underlain by old red sandstone. *Earth Surface Processes*, **4**. 167-178.

Whitehouse, I. E., McSaveney, M. J., Knuepfer, P. L. K. and Chinn, T. J. H. (1986): Growth of weathering rinds on Torlesse sandstone, southern Alps, New Zealand. In Colman, S. M. and Dethier, D. P. *eds., Rates of Chemical Weathering of Rocks and Minerals. Academic Press*, Orlando, 603p.

Yatsu, E. (1988): *The Nature of Weathering*. Sozosha, Tokyo, 624p.

Yoshioka, R. (1975): Estimation of amounts of weathered products through chemical composition of waters in the Kamenose landslide area. *Bull. Disaster Prev. Res. Inst. Kyoto Univ.*, **25**, 1-15.

Young, B. B. and Millman, A. P. (1964): *Trans. Inst. Min. Metal.*, **73**, 437-476.