Appendix II

Checklist for Tephra Analysis

Sample Processing

- ❑ Sample processing details (sieving, chemical treatments, density separation, magnetic separation, etc.)

Physical Characteristics

- ❑ particle size - quantitative or generalized using White and Houghton (2006) terminology
- ❑ petrography - report assemblage and relative abundance of crystal phases
- ❑ componentry (for coarse deposits)
- ❑ alteration/hydration - of clasts and shards, surface or pervasive, etc.
- ❑ color of juvenile components (use Munsel rock color chart)
- ❑ glass color
- ❑ grain morphology - use guides
- ❑ vesicularity
- ❑ density of shards

Geochemistry

- ❑ indicate type of geochemical analysis
- ❑ indicate type of material analyzed (glass, Fe-Ti oxides, specific juvenile component etc.)

Major Element Analyses

Electron probe microanalysis (EPMA) - glass and Fe-Ti oxide mineral phases

- ❑ review recommendations in Kuehn et al. (2011)
- ❑ disclose type of instrument and location of facility
- ❑ disclose analytical conditions including beam diameter, accelerating voltage, beam current, count times for each element
- ❑ report any automation software and any correction routines (e.g. CIT-ZAF reduction of Armstrong, 1995)
- ❑ report calibration standards (primary standards) and which elements they were used to calibrate as well as and working standards (secondary standards)

- ❑ report methods used to monitor instrument drift during sample analyses (i.e. routine analysis of secondary standards and methods of correcting drift)
- ❑ report methods to reduce Na_2O drift
- ❑ analyze and report concentrations for SiO2, TiO_2, Al_2O_3, FeO_T, MnO, MgO, CaO, Na_2O, K_2O, Cl, P_2O_5
- ❑ report number of point analyses per sample - 20 or more points on homogeneous glass is recommended, more for heterogeneous glass
- ❑ filter data to remove crystal phase analyses, points contaminated by microlite inclusions and multiple populations of glass; for heterogeneous glass report all data so show range
- ❑ report normalized, average data with standard deviations within the report
- ❑ report raw, unnormalized, point data as supplementary material
- ❑ report raw, unnormalized, point data on working standard results as supplementary material

Whole rock (XRF) bulk rock analysis (used in proximal settings - not for long-distance correlations)

- ❑ disclose type of instrument and location of facility
- ❑ number of clasts analyzed
- ❑ disclose instrument conditions or reference existing standard methods (e.g. Johnson et al. 1999)

Trace Element Analyses

Laser-ablation ICPMS- Minor and Trace elements

- ❑ disclose type of instrument and location of facility
- ❑ disclose instrument conditions including beam diameter
- ❑ report standards used to calibrate the instrument and internal standards used to monitor instrument drift.
- ❑ disclose calibration routine
- ❑ report any automation software and any correction routines
- ❑ report number of points analysed per sample

Ion Probe Microanalysis (secondary ionization mass spectrometry) - Minor and Trace elements

- ❑ disclose type of instrument and location of facility
- ❑ disclose instrument conditions including beam diameter
- ❑ report standards used to calibrate the instrument and internal standards used to monitor instrument drift.
- ❑ disclose calibration routine

- ❑ report any automation software and any correction routines
- ❑ report number of points analysed per sample

ICP-MS on pure glass splits or juvenile lapilli (bulk analysis)

- ❑ disclose type of instrument and location of facility
- ❑ disclose instrument conditions or reference existing standard methods (e.g. Pearce et al. 2007; Pearce et al. 2010)

References:

Armstrong, J.T., 1995, CITZAF—A package of correction programs for the quantitative electron microbeam x-ray analysis of thick polished materials, thin films, and particles: Microbeam Analysis, v. 4, p. 177–200.

Johnson, D.M., Hooper, P.R., and Conrey, R.M., 1999, XRF analysis of rocks and minerals for major and trace elements on a single low dilution Li-tetraborate fused bead: Advances in X-ray Analysis, v. 41, p. 843–867.

Kuehn, S. C., Froese, D. G., & Shane, P. A. R. ,2011, The INTAV intercomparison of electron-beam microanalysis of glass by tephrochronology laboratories: results and recommendations. Quaternary International, v. 246, n.1, 19-47.

Pearce, N.J.G., Denton, J.S., Perkins, W.T., Westgate, J.A., Alloway, B.V., 2007. Correlation and characterisation of individual glass shards from tephra deposits using trace element laser ablation ICP-MS analyses: current status and future potential. Journal of Quaternary Science 22, 721e736.

Pearce, N.J.G., Perkins, W.T., Westgate, J.A., Wade, S.C., 2010. Trace-element microanalysis by LA-ICP-MS: the quest for comprehensive chemical characterization of single, sub-10 mm volcanic glass shards. In: Abstracts, International Field Conference on Tephrochronology, Volcanism, and Human Activity, Kirishima, Japan (9e17 May). INQUA International Focus Group on Tephrochronology and Volcanism (INTAV), pp. 77e78.

Geochronology

- ❑ report the method of dating (radiocarbon, mineral phase, fission track, correlation, modeled, magnetostratigraphy, etc.)
- ❑ report laboratory facility used for dating and their lab sample ID
- ❑ description of material dated
- ❑ reported age
- ❑ standard error on age

Radiocarbon dating

Suitable Materials	AMS	Conventional
Woody	2-5 mg	10-25 g
Macrofossils (leaves, seeds, twigs, roots, pollen, and phytoliths)	2-5 mg	10-25 g
Charcoal (as long as it's not detrital)	1-5 mg	10-100 g
Peat	2-20 mg	20-200 g
Humic soils and paleosols (soil organic matter)	10-200 mg	100-2,000 g

AMS-accelerator mass spectrometry technique; Conventional- counting technique; numbers are sample sizes for the given techniques.

- ❑ raw age for ^{14}C ages
- ❑ calibrated age, and method used to calibrate

Radiometric dating

- ❑

Fission-track dating of glass

- ❑

Magnetostratigraphy

- ❑

Depositional age modelling

- ❑