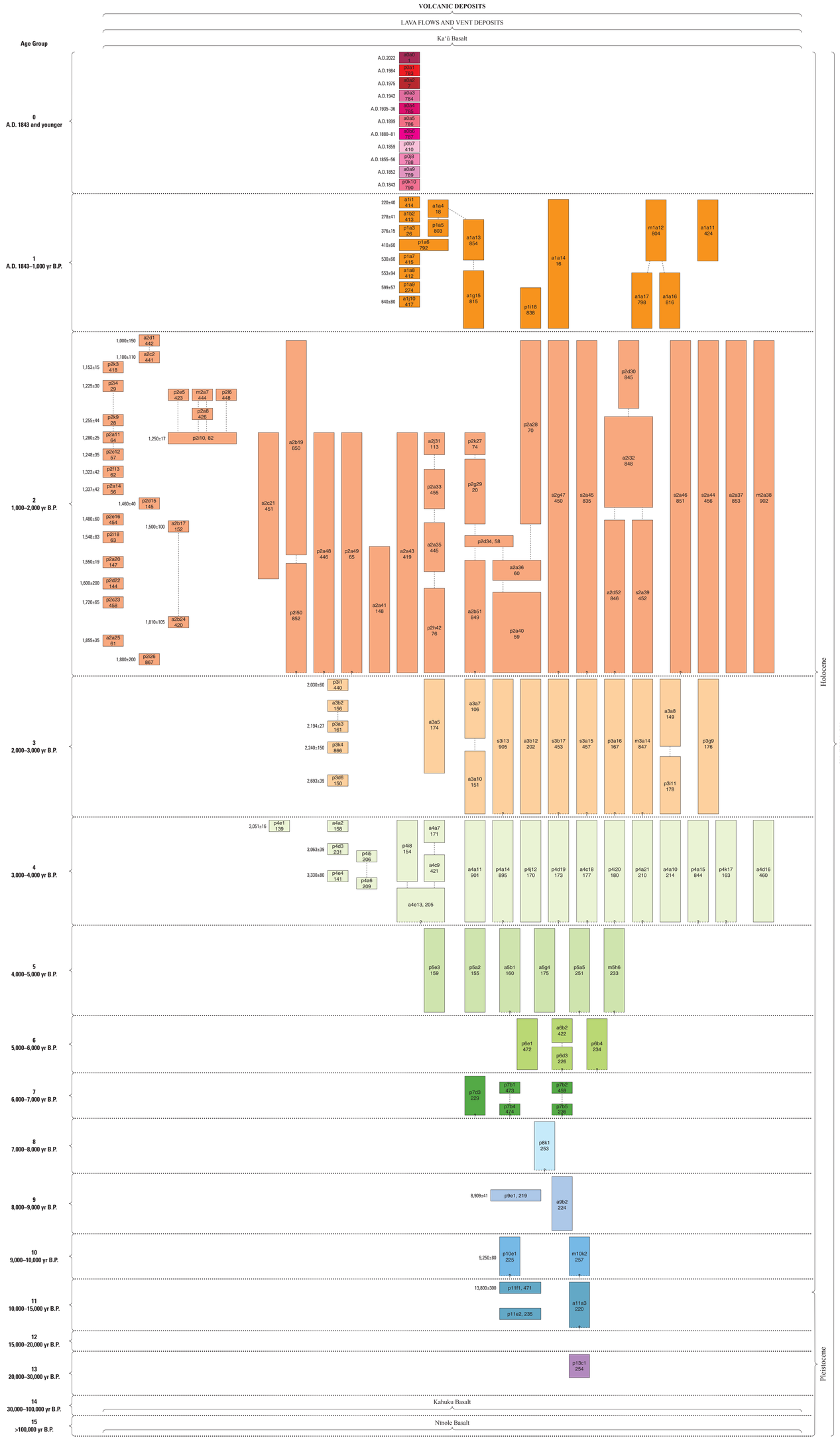
U.S. Department of the Interior
U.S. Geological Survey

Scientific Investigations Map 2932–E
Sheet 2 of 2
Pamphlet accompanies map

CORRELATION OF MAP UNITS

[Only the unit label for the most common flow type, listed first in the unit description (Description of Map Units, pamphlet), is included in the Correlation of Map Units and table 2. See Description of Map Units for detailed unit age information. Uncalibrated radiocarbon ages are reported in years before present (yr B.P.). Undated flows are correlated with dated flows using superposition; surface exposure; color change caused by solar radiation; extent of weathering; tree height, size, and girth; diversity of native plant species; and soil and ash accumulation. Equivalence of horizontal position of undated flows does not imply age equivalence and vertical positioning of one unit over another applies only to the stratigraphic relations of the units that are superimposed (indicated by gray dashed lines; for example, units p2i4 and p2k9 or p2d30 and a2i32) in the correlation diagram. Queried dashed line at bottom of unit box shows base of flow is concealed. In addition to the map unit label, a unique, three-digit flow identification number (FID; for example, FID 783) is assigned to each mapped flow unit to facilitate use of the database (https://doi.org/10.3133/sim2932e); the FID is essential as a unique descriptor for unit identification in the database. FID numbers are included for the units shown]



LIST OF MAP UNITS

[Some unit exposures on the printed or plotted map are not labeled to avoid obscuring data; use unit color or database (https://doi.org/10.3133/sim2932e) for unit identification. The simplified map unit label is not unique and provides quick access to flow morphology, flow age group, phenocryst mineralogy, and flow number in an age group (table 1, sheet 1); this non-unique unit label may be used for an entirely different unit on a different flank of Mauna Loa. We use the term "phenocryst" for any mineral ≥1 mm in maximum diameter. Pyroxene is not an abundant phenocryst in Mauna Loa lava flows; therefore, it is not included in phenocryst mineralogy. In addition to the map unit label, a unique, three-digit flow identification number (FID; for example, FID 783) is assigned to each mapped flow unit to facilitate use of the database for the entire Mauna Loa edifice; the FID is essential as a unique descriptor for unit identification in the database]

SEDIMENTARY DEPOSITS

These deposits were too small and transient to map at this scale. They consist chiefly of colluvial and alluvial deposits of basalt clasts and pebble- to cobble-sized gravel in drainages that occur locally within parts of the map area. We also include unconsolidated sand along the coast.

VOLCANIC DEPOSITS

LAVA FLOWS AND VENT DEPOSITS

Ka'ū Basalt

Age Group 0 (A.D. 1843 and younger; Holocene)

- a0a0, p0a0, s0a0 — **A.D. 2022 flow**—FID 1
- p0a1, a0a1, s0a1 — **A.D. 1984 flow**—FID 783
- a0a2, p0a2, s0a2 — **A.D. 1975 flow**—FID 7
- a0a3, m0a3, p0a3, s0a3 — **A.D. 1942 flow**—FID 784
- a0a4, m0a4, p0a4, s0a4 — **A.D. 1935–36 flow**—FID 785
- a0a5, p0a5, s0a5 — **A.D. 1899 flow**—FID 786
- a0a6 — **A.D. 1880–81 flow**—FID 787
- p0b7, a0b7, s0b7 — **A.D. 1859 flow**—FID 410
- p0j8, a0j8, s0j8 — **A.D. 1855–56 flow**—FID 788
- a0a9, s0a9 — **A.D. 1852 flows**—FID 789
- p0k10, a0k10, m0k10, s0k10 — **A.D. 1843 flow**—FID 790

Age Group 1 (A.D. 1843–1,000 yr B.P.; Holocene)

- a1i1, s1i1 — **Radial vent 414 flow**—FID 414
- a1b2, p1b2, s1b2 — **Keʻāmuku flow**—FID 413
- p1a3 — **Landing Zone flow**—FID 26
- a1a4, s1a4, p1a4, m1a4 — **Pohakuʻohanalei flow**—FID 18
- p1a5, a1a5, s1a5 — **Flow 803**—FID 803
- p1a6 — **ʻĀinahou flow**—FID 792
- p1a7, s1a7 — **Radial vent 415 flow**—FID 415
- a1a8, s1a8 — **Puʻuʻouo flow**—FID 412
- p1a9, a1a9, m1a9, s1a9 — **Kc A Poʻomuku flow**—FID 274
- a1j10, s1j10 — **Radial vent 417 flow**—FID 417
- a1a11, m1a11, p1a11, s1a11 — **NOAA flow**—FID 424
- m1a12, a1a12 — **Flow 804**—FID 804
- a1a13 — **Flow 854**—FID 854
- a1a14, p1a14 — **Flow 16**—FID 16
- a1g15 — **Flow 815**—FID 815
- a1a16 — **Flow 816**—FID 816
- a1a17, s1a17 — **Flow 798**—FID 798
- p1i18, s1i18 — **Kcʻāmoku Kīpukakulalio west flow**—FID 838

Age Group 2 (1,000–2,000 yr B.P.; Holocene)

- a2d1 — **Radial vent 442 flow**—FID 442
- a2c2, p2c2 — **Honey Bee flow**—FID 441
- p2k3, a2k3, s2k3 — **Keauhou Two flow**—FID 418
- p2i4, a2i4 — **Flow 29**—FID 29
- p2e5, s2e5 — **Radial vent 423 flow**—FID 423
- p2l6, s2l6 — **Radial vent 448 flow**—FID 448
- m2a7, s2a7 — **Radial vent 444 flow**—FID 444
- p2a8, s2a8 — **Radial vent 426 flow**—FID 426
- p2k9, a2k9, m2k9 — **Flow 28**—FID 28
- p2i10, a2i10, a2i10, p2h10, m2j10, a2g10, m2h10 — **Flow 82**—FID 82
- p2a11, a2a11 — **Flow 64**—FID 64
- p2c12, a2c12, a2d12 — **Flow 57**—FID 57
- p2f13, p2d13, a2d13, a2f13, m2d13, a2a13, m2f13, p2c13 — **Pōhakuloa flow**—FID 62
- p2a14 — **Hōkūkano flow**—FID 56
- p2d15 — **Flow 145**—FID 145
- p2e16, s2e16 — **Radial vent 454 flow**—FID 454
- a2b17, p2b17 — **Flow 152**—FID 152
- p2i18, a2i18 — **Flow 63**—FID 63
- a2b19 — **Flow 850**—FID 850
- p2a20, a2a20 — **Flow 147**—FID 147
- s2c21 — **Radial vent 451 flow**—FID 451
- p2d22, a2d22, m2d22, p2c22, a2b22 — **Poopaaelua flow**—FID 144
- p2c23, s2c23 — **Radial vent 458 flow**—FID 458
- a2b24, p2b24, m2b24, s2b24 — **Radial vent 420 flow**—FID 420
- a2a25 — **Flow 61**—FID 61
- p2i26, a2i26, s2i26 — **ʻĀinakahiko flow**—FID 867
- p2k27, a2k27, p2j27, a2j27, m2k27 — **Flow 74**—FID 74
- p2a28, a2a28 — **Flow 70**—FID 70
- p2g29, a2g29 — **Flow 20**—FID 20
- p2d30, a2d30 — **Flow 845**—FID 845
- a2j31 — **Flow 113**—FID 113
- a2i32, m2i32 — **Flow 848**—FID 848
- p2a33, a2a33, m2a33, s2a33 — **Radial vent 455 flow**—FID 455
- p2d34, a2d34, a2f34, p2f34, m2d34, a2b34 — **Flow 58**—FID 58
- a2a35, p2a35, m2a35, m2b35, s2a35, a2b35 — **Crack flow**—FID 445
- a2a36 — **Flow 60**—FID 60
- a2a37 — **Flow 853**—FID 853
- m2a38, s2a38 — **Flow 902**—FID 902
- s2a39 — **Radial vent 452 flow**—FID 452
- p2a40, a2a40 — **Flow 59**—FID 59
- a2a41, p2a41 — **Flow 148**—FID 148
- p2h42 — **Flow 76**—FID 76
- a2a43, m2a43, p2a43, s2a43 — **Radial vent 419 flow**—FID 419
- s2a44, p2a44 — **Radial vent 456 flow**—FID 456
- s2a45 — **Pukauahi flow**—FID 835
- s2a46 — **Flow 851**—FID 851
- s2g47 — **Radial vent 450 flow**—FID 450
- p2a48, s2a48 — **Radial vent 446 flow**—FID 446
- p2a49 — **Flow 65**—FID 65
- p2i50 — **Flow 852**—FID 852
- a2b51, p2b51 — **Flow 849**—FID 849
- a2d52, p2d52, s2d52 — **Waterhole kīpuka flow**—FID 846

Age Group 3 (2,000–3,000 yr B.P.; Holocene)

- p3i1 — **Kaʻawaloa flow**—FID 440
- a3b2, p3b2, a3a2, m3b2 — **Flow 156**—FID 156
- p3a3, a3a3 — **Flow 161**—FID 161
- p3k4 — **Puʻukahiliku flow**—FID 866
- a3a5 — **Flow 174**—FID 174
- p3d6, p3e6, m3d6, a3d6, a3e6 — **Flow 150**—FID 150
- a3a7 — **Flow 106**—FID 106
- a3a8, m3a8, p3a8 — **Flow 149**—FID 149
- p3g9, a3g9 — **Flow 176**—FID 176
- a3a10 — **Flow 151**—FID 151
- p3i11 — **Flow 178**—FID 178
- a3b12 — **Flow 202**—FID 202
- s3i13 — **Flow 905**—FID 905
- m3a14, a3a14, s3a14, p3a14 — **Flow 847**—FID 847
- s3a15, p3a15 — **Puu Keanui flow**—FID 457
- p3a16 — **Flow 167**—FID 167
- s3b17 — **Radial vent 453 flow**—FID 453

Age Group 4 (3,000–4,000 yr B.P.; Holocene)

- p4e1, a4e1, l4e1 — **Moinui Point flow**—FID 139
- a4a2, p4a2 — **Flow 158**—FID 158
- p4d3, a4d3 — **Flow 231**—FID 231
- p4e4 — **Flow 141**—FID 141
- p4i5, a4i5 — **Flow 206**—FID 206
- p4a6 — **Flow 209**—FID 209
- a4a7 — **Flow 171**—FID 171
- p4i8, a4i8 — **Flow 154**—FID 154
- a4c9, p4c9, s4e9, a4e9, p4e9 — **Kanikū flow**—FID 421
- a4a10 — **Flow 214**—FID 214
- a4a11, s4a11 — **Flow 901**—FID 901
- p4j12, m4j12 — **Flow 170**—FID 170
- a4e13 — **Flow 205**—FID 205
- p4a14, s4a14, m4a14, a4a14 — **Flow 895**—FID 895
- p4a15 — **Flow 844**—FID 844
- a4d16, p4d16, s4d16 — **Pōhakuloa camp flow**—FID 460
- p4k17, p4j17, a4k17 — **Flow 163**—FID 163
- a4c18 — **Flow 177**—FID 177

Age Group 4 (3,000–4,000 yr B.P.; Holocene)—Continued

- p4d19, a4d19 — **Flow 173**—FID 173
- p4i20, m4i20 — **Flow 180**—FID 180
- p4a21 — **Flow 210**—FID 210

Age Group 5 (4,000–5,000 yr B.P.; Holocene)

- a5b1 — **Flow 160**—FID 160
- p5a2, a5a2, m5a2 — **Flow 155**—FID 155
- p5e3, a5e3, p5f3, m5e3 — **Kanimoe flow**—FID 159
- a5g4 — **Flow 175**—FID 175
- p5a5, a5a5, m5a5 — **Flow 251**—FID 251
- m5h6, a5h6 — **Flow 233**—FID 233

Age Group 6 (5,000–6,000 yr B.P.; Holocene)

- p6e1, a6e1 — **Radial vent 472 flow**—FID 472
- a6b2, s6b2, a6c2, a6d2, a6e2, m6b2 — **Radial vent 422 flow**—FID 422
- p6d3, m6d3, a6d3 — **Flow 226**—FID 226
- p6b4 — **Flow 234**—FID 234

Age Group 7 (6,000–7,000 yr B.P.; Holocene)

- p7b1, a7b1 s7b1, m7b1, a7l1 — **Puʻukoli flow**—FID 473
- p7b2, a7b2, s7b2 — **Radial vent 459 flow**—FID 459
- p7d3, p7f3, p7c3, m7f3, p7e3, p7a3, a7d3, a7e3, m7d3 — **Keawaiki flow**—FID 229
- p7b4, a7b4, s7b4, m7b4 — **Radial vent 474 flow**—FID 474
- p7b5, m7b5, a7b5 — **Flow 236**—FID 236

Age Group 8 (7,000–8,000 yr B.P.; Holocene)

- p8k1 — **Flow 253**—FID 253

Age Group 9 (8,000–9,000 yr B.P.; Holocene)

- p9e1 — **Flow 219**—FID 219
- a9b2, p9b2 — **Konawaena High School flow**—FID 224

Age Group 10 (9,000–10,000 yr B.P.; Holocene)

- p10e1 — **Painted Church flow**—FID 225
- m10k2 — **Kanakau flow**—FID 257

Age Group 11 (10,000–15,000 yr B.P.; Holocene and Pleistocene)

- p11f1 — **Kikiʻaeʻae flow**—FID 471
- p11e2 — **Flow 235**—FID 235
- a11a3, p11a3 — **Flow 220**—FID 220

Age Group 12 (15,000–20,000 yr B.P.; Pleistocene)

[No units of this age group are located at the surface in the map area]

Age Group 13 (20,000–30,000 yr B.P.; Pleistocene)

- p13c1 — **Flow 254**—FID 254

Kahuku Basalt

Age Group 14 (30,000–100,000 yr B.P.; Pleistocene)

[No units of this age group are located at the surface in the map area]

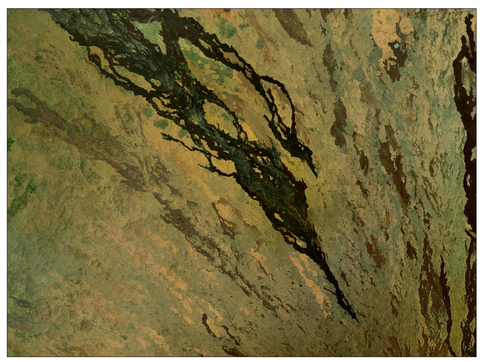
Nīnole Basalt

Age Group 15 (>100,000 yr B.P.; Pleistocene)

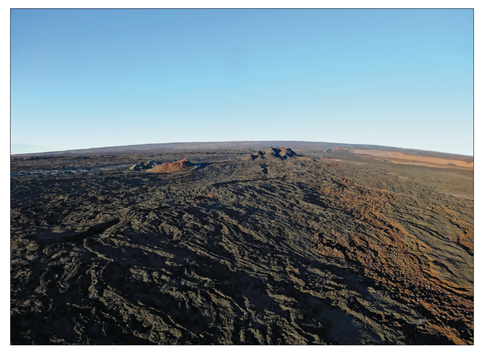
[No units of this age group are located at the surface in the map area]

EXPLANATION OF MAP SYMBOLS

- **Contact**—Approximately located. Internal contact defines flows
- **Fault**—Ball and bar on downthrown block. Solid where certain, dashed where approximate, dotted where concealed
- **Cone vent**—Trace of cone vent
- **Radial cone vent**—Trace of radial cone vent
- **Fissure vent**—Trace of fissure vent. Solid line where certain, dashed line where concealed
- **Radial fissure vent**—Trace of radial fissure vent. Solid line where certain, dashed line where concealed
- **Open ground crack**
- **Littoral deposit**
- **ʻAʻā or mixed flow**
- **Spatter**
- **Ash**—Ash covering flows
- H — **Hualālai deposit**
- MK — **Mauna Kea deposit**
- **Radiocarbon-dated sample locality**—Age shown in yr B.P. See table 2 (pamphlet) for analytical data; note that not all age localities are in map area
- 4790 — **Sample from surface flow**—Charcoal
- 8730 — **Sample from measured section**—Does not date surface flow



Satellite image of the A.D. 1859 radial vents high on the northwest flank of Mauna Loa. This eruption is notable for several reasons. It is the most voluminous eruption in the historical period (A.D. 1843 and younger), producing a 52-kilometer-long (32-mile-long) lava flow, the longest in the State of Hawaii. Lava effused from two sub-parallel fissure systems. The main fissure originated at 11,135 feet and another fissure system opened 1.3 kilometers northeast of the first at an elevation of 8,695 feet. Both systems fed flows simultaneously that joined downslope and formed one flow field that reached the sea in 8 days. Image from Esri and its licensors, copyright 2022.



Photograph looking up the Northeast Rift Zone of Mauna Loa. Prominent cone right of center is Dewey Cone, the main vent of the A.D. 1899 eruption. Behind Dewey Cone, to the right, is Steaming Cone, a vent formed during the A.D. 1855–56 eruption, and above Steaming Cone is Pohakuʻohanalei, a prehistoric cone.

Photograph of the lava diversion structure that protects the National Oceanic and Atmospheric Administration (NOAA) Mauna Loa Observatory, which is the site of the longest record of anthropogenic CO_2 emissions. Flows from Mauna Loa erupted in the vicinity in 1843, 1852, 1855, 1880, 1899, 1935, 1942, 1975, 1984, and 2022.

Photograph of Honey Bee vent on the flank of Mauna Loa. The Honey Bee vent is enigmatic. It is aligned with the contour of the land (versus orthogonal). The main vent region consists of displaced blocks, ~150 meters long that were uplifted ~15 meters vertically, and at the base of the massive blocks, fluid pāhoehoe erupted. In the photograph, the upslope block is to the right, lava exited to the left. Blocks of basalt, fallen after earthquakes, obscure the floor of the vent. Person for scale.

Geologic Map of the Northwest Flank of Mauna Loa Volcano, Island of Hawai'i, Hawaii

By
Frank A. Trusdell and John P. Lockwood

2024

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