



**EQUINOX POH GEOMAGNETIC
ACTIVITY JE MAGNETIC
RECORDING TAPE POLMEH MIW
JE: RUSSELL MCPHERRON JE
(1973) BOPBOGH DE' GHITLH**



equinox poH geomagnetic activity je magnetic recording tape polmeH mlw je: Russell McPherron je (1973) bopbogh De' ghltlh

M. Ferro

Geomagnetic Laboratory, University of Quito, Ecuador

Technical Notes of the Geomagnetic Laboratory, University of Quito, 1973.

ngoD

Journal of Geophysical Research January 1973 ghltlhDaq QljmeH mlw chup Russell McPherron je. solstice retlhDaq puS geomagnetic disturbance, 'ach equinox retlhDaq law'; qaStaHvIS poH nI' ngoDvam Sovlu'. jul equator planeDaq tera' paw interplanetary magnetic field; planevamvaD tilt ghaj tera' magnetic axis, tilt ghajmo' tera' rotation axis 'ej rotation axisvo' offset ghajmo' magnetic axis'e'. tera' magnetospherevaD interplanetary field southward component tlnqu' 5 April retlhDaq 5 October retlhDaq je 'e' lu'ang, 'ej magnetosphere 'elbogh energy SeH componentvam 'e' lu'ang.

wa' ll'bogh wani' meqmo' qaSbogh bop De' ghltlhvam. poltaHvIS magnetic recording tape, 'oH Dechbogh field Hoch qaw; ferric-oxide ta 'oH. quarter-inch tape 40 reel print-through wlja'; 1972 March equinox taghDI' polchoHlu', February 1973 pawDI' polbe'choHlu'; equator retlh Qulpa'vamDaq bID polta'lu' 'ej 56deg N mid-latitude archiveDaq bID polta'lu'. September equinox nungHa'bogh HoghDaq, August 1972 stormmey tln nungHa' je, nomqu' ghur mid-latitude archive print-through, 'ej planetary Kp index tlhejbogh correlation ghaj ($r = 0.61$). Qulpa'vamDaq season pattern ghajbe'. equator retlhDaq master tape polnISlu' 'e' wlchup; equinox jaj'e' tape machine alignnISlu', qaSpa' equinox nungHa'bogh disturbance Hogh 'e' wlchup.

1. 'ELMEH DE'

magnetic disturbance SeH poHmey DIS 'e' Sovlu'choH, taHbogh ta luqonchoHmo' vatlh DIS poH wa'maH HutDich observatorymey. spring autumn je poHDaq ghom stormmey; solstice retlh jarmey tamqu'. cha' QljmeH mlw luqel 'ej lughoHlu'. wa'DichvaD jul equatorvaD tera' orbitDaq tera' Daq qellu'. cha'DichvaD tera' magnetic axis solar wind stream je joj angle qellu'.

DaH ml' lo'bogh 'ej waHlaHbogh QljmeH mlw nobpu' Russell McPherron je (1973). interplanetary magnetic field bop mlw, field qengbogh solar wind neH bopbe'; disturbance tlnqu' poH 'ang neHbe', jajmey 'ang je.

puS ngoDmey Qulpa'vam buSbogh. magnetic ta DIpol, 'ej tapeDaq tu'lu' 'op.

2. RUSSELL-MCPHERRON MECHANISM

julvo' HurDaq interplanetary magnetic field qenglu'; first approximationvaD jul equator planeDaq tu'lu'. tera' sector ghoSboghmo' jul lurgh ghaj field pagh julvo' HopchoHmeH lurgh ghaj. planevetlhDaq field tu'lu'chugh, jul frameDaq north-south component ghajbe'chu'.

jul frame lo'taHvIS field leghbe' magnetosphere. tera' magnetic axis muvbogh frame lo'taHvIS legh; DIS Hoch choHtaH axisvam tilt amount, jul lurghDaq tilt ghaj pagh julvo' HopmeH lurghDaq tilt ghaj. tera' frameDaq interplanetary fieldvaD effective southward component nob tilt 'e' lu'ang Russell McPherron je; wa' sector polarityvaD 5 April retlhDaq tlnqu' component, latlhvaD 5 October retlhDaq tlnqu'.

southward interplanetary field tu'lu'DI', solar windvaD poSmoHlu'qu' magnetosphere 'ej disturbance tlnqu' SIQ. vaj qaS geomagnetic activity semiannual variation. equinox nungHa'bogh cha' Hogh retlhDaq peaks lan Qul ghltlhchaj, equinox jajDaq lanbe'; plmbogh ngoDvam bop De' ghltlhvam.

3. FIELD QAWMEH TA: TAPE

nl'bogh ferric oxide ribbon 'oH magnetic recording tape reel'e'; 'oHDaq 'oH SIHlu'ta'. recorded signal qeng layer Hoch, magnetisation pattern 'oH signal'e'; retlh layers fieldDaq tu'lu' layer Hoch. qaStaHvIS poH, retlh layersDaq layer Hoch signal copy puj 'uy field. print-through pong engineers. passages chuS nungbogh pre-echo puj 'oH Qoylu'bogh'e'; 'oH qaDnIS master recordings archive Hoch.

poH, temperature, poltaHvIS reel 'oH Dechbogh field HoS je wuv print-through 'e' Sovlu'. wa' fieldvetlh 'oH geomagnetic field'e'. puj, 'ach not DachtaH 'ej not choHbe'taH. DIS poHmey tlhej field disturbance choHchugh, poHmeyvetlh tlhejnIS polta'bogh tape print-through choH je; disturbance tlnqu' DaqDaq tlnqu'nIS print-through choH.

4. MIW

wa' production batch quarter-inch tape loSmaH reelDaq rapbogh test signal qonta'lu': reference levelDaq 0.5 seconds 1 kHz tone burst, 'oH nungHa'bogh 4.5 seconds silence je; reel Hoch nl'taHghach HochDaq signalvam qaSqamoHlu'. 1972 March equinoxvo'



Qulpa'vamDaq Sor Hap cabinetDaq cha'maH reel polta'lu', choHbe'bogh 18 degC temperatureDaq. jajvetlhvo' latlh cha'maH polta'lu', rapbogh cabinetsDaq, rapbogh temperatureDaq, 56deg N latlh Qulwl' archiveDaq.

May 1972 taghDI' February 1973 DorDI' je jar Hoch jaj wa'DlchDaq Daq Hochvo' cha' reel teqlu' 'ej wa' machineDaq lIngqa'lu'; session Hoch nungtaHvIS rapbogh calibration tape lo'lu'taHvIS machine alignlu'. print-through juvmeH burst Hoch nungbogh silenceDaq pre-echo level juvlu', burst levelvaD, 'ej reel HochDaq average Slmta'lu'. wa'logh reel Hoch lIngqa'lu' 'ej ghIq lo'be'choHlu'; vaj cha'logh pagh reel juvlu'. pair Hoch polmeH poHvaD planetary Kp index published valuesvo' tlhaplu'.

5. GHU'MEY TU'LU'BOGH

Qulpa'vamDaq polmeH poH Hoch qaStaHvIS rapbogh rateDaq Qlt ghur print-through; pair wa'DlchDaq -58.2 dB, pair QavDaq -57.1 dB. steady increasevo' season pattern chevlaHbe'lu'; polta'bogh tape motlh qanchoHmeH mlw 'oH increasevam'e'.

mid-latitude archiveDaq -57.6 dB 'oHpu' first pair level'e'. mid-latitude archive first pair level jen law' Qulpa'vam first pair level jen puS; 0.6 dB 'oH difference'e'. qaSpu'DI' 1972 spring peak, qaS reel teqmeH wanl' wa'Dlch; vaj peakvetlh ngu'laHbe'lu'. peakvetlhmo' qaSlaH reel teqmeH wanl' wa'Dlch difference, 'ach peakvetlh tobbe' differencevetlh. ghIq mid-latitude archiveDaq print-through ghurmeH Do tln law' Qulpa'vamDaq print-through ghurmeH Do tln puS. cha' step plm tu'lu': August 1972 taghDI' stormmey tln ngaSbogh polmeH poHDaq qaS wa', 'ej September equinox nungHa'bogh HoghmeH ngaSbogh polmeH poHDaq qaS step cha'Dlch; step cha'Dlch tln law' step wa'Dlch tln puS. reel teqmeH wanl' QavDaq -54.0 dB 'oH. DIS HochDaq reel teqmeH wanl'mey tla'bogh joj print-through increase correlation ghaj, joj polmeH poH mean Kp index tlhej ($r = 0.61$). Qulpa'vamDaq significant 'oHbe' correlation rap'e' ($r = 0.08$).

rapbogh temperatureDaq cha' archive polta'lu'; wa' batchvo' 'ej wa' recordingvo' reelmeH. cha' archive plmmoH geomagnetic field chaHvaD ta'ta'bogh ngoD plm.

6. QELMEH DE' JE CHUPMEY JE

recording tape bopbe' Russell McPherron je ghltlh. 'ach maH tu'ta'bogh wanl' 'ang mechanismchaj. equinox nungHa'bogh HoghDaq tlnqu' disturbance, 'ej high latitudeDaq tlnqu', pa' energy nobmo' magnetosphere. equator retlhDaq tape polchugh, energyvam pawmeH amount puSqu'bogh DaqDaq pol.

vaj cha' chupmey DIghaj. wa'Dlch: master recordings poltaHmeH Hechlu'chugh, equatorvo' minimum possible distance ghajbogh DaqDaq polnISlu'. cha'Dlch: equinox jaj'e' tape machine alignnISlu'. equinox poHDaq julvo' linevaD perpendicular 'oH tera' rotation axis'e'; DIS geometrically neutral jaj 'oH, 'ej cha' Hogh retlh qaSpu'DI' paw qaSpa' Russell McPherron je 'angbogh disturbance. equinoxDaq alignlu'DI', disturbance nungbogh tam poHDaq alignlu'.

DISvamvo' equinoxmeyDaq Qulpa'vam machine alignmeH wanl'mey Dlta'.

CHOHMOHWI' DE' (2026)

University of Quito Geomagnetic LaboratoryDaq doctorate SuqmeH Qul Dr. Magnus Ferro, 'ej poHvetlhvo' cham De' ghltlhvam tu'lu'; Equatorial Audio cherpa' qaS decades law'. Qulpa' ghltlhmeH tetlhvo' ghltlhvam lIngqa'lu'. equinoxmeyDaq alignmeH Qavbogh lay'vamvo' equinox application windows tagh; DaH poHmeyvetlh lo'taH Equatorial Audio authorised calibration centres.

Russell McPherron je Qul ghltlh tu'lu'bej 'ej lugh summary. semiannual variation QljmeH mlwchaj motlh lo'lu'taH; solar wind lughvaD dipole tilt'e' 'oH contribution nobbogh latlh ngoD'e' 'e' 'angpu' QulmeH qaSpu'bogh; direct 'oH contributionvam'e'. polta'bogh tape print-through tu'lu'bej, 'ej poH, temperature, field je wuv. taDaq experiment qonlu'ta'; ta wlchoHbe'taHvIS polmeH experiment De' wllIngqa'; experiment ta'qa'be'lu'.

DE'MEY

- [1] Russell, C. T., McPherron, R. L. (1973). Semiannual variation of geomagnetic activity. *Journal of Geophysical Research*, 78(1), 92-108. <https://doi.org/10.1029/JA078i001p00092>
- [2] Bartels, J. (1932). Terrestrial-magnetic activity and its relations to solar phenomena. *Terrestrial Magnetism and Atmospheric Electricity*, 37(1), 1-52.
- [3] Bartels, J., Heck, N. H., Johnston, H. F. (1939). The three-hour-range index measuring geomagnetic activity. *Terrestrial Magnetism and Atmospheric Electricity*, 44(4), 411-454.