ΓΕΩΔΑΙΣΙΑ

ΣΧΗΜΑ ΚΑΙ ΜΕΓΕΘΟΣ ΓΗΣ
ΠΕΔΙΟ ΒΑΡΥΤΗΤΑΣ

ΚΑΜΠΥΛΗ ΓΗ
ΜΕΓΑΛΕΣ ΑΠΟΣΤΑΣΕΙΣ

КАМПУЛОТНТА ГНΣ $S^2/2R$

ΔΙΑΘΛΑΣΗ

ΔΟΡΥΦΟΡΙΚΗ ΓΕΩΔΑΙΣΙΑ

ΔΕΚΑΕΤΙΑ 1930
PHOTOTRIANGULATION AERIENNE

ΔΕΚΑΕΤΙΑ 1940
ΕΚΛΕΙΨΕΙΣ ΗΛΙΟΥ
ΕΠΙΠΡΟΣΘΗΣΕΙΣ
ΜΕΘΟΔΟΣ VAISALA

ΔΕΚΑΕΤΙΑ 1950
MOON CAMERA
SHORAN + HIRAN
ΦΩΤΟΓΡΑΦΙΣΕΙΣ ΔΟΡΥΦΟΡΩΝ
ΟΚΤΩΒΡΙΟΣ 1957 SPUTNIK I
ΝΟΕΜΒΡΙΟΣ 1957 SPUTNIK II
ΙΑΝΟΥΑΡΙΟΣ 19 58 EXPLORER I
1958
GEODETIC USES OF ARTIFICIAL SATELLITES, ROCKETS AND THE MOON
Γ. ΒΕΗΣ, ΔΙΔ. ΔΙΑΤΡΙΒΗ, OHIO STATE UNIVERSITY

ΔΕΚΑΕΤΙΑ 1960
TRANSIT
LASER

ΔΕΚΑΕΤΙΑ 1970

TRANSIT

LASER

VLBI

SATELLITE ALTIMETRY

ΔΕΚΑΕΤΙΑ 1980

TRANSIT

LASER

VLBI

SATELLITE ALTIMETRY

REMOTE SENSING

GPS

ΔΕΚΑΕΤΙΑ 1990, 2000, 2010…….

TRANSIT

LASER

VLBI

SATELLITE ALTIMETRY

REMOTE SENSING

GPS….GLONASS, GALILEO, BEIDU

LA "PHOTOTRIANGULATION AÉRIENNE" ENTRE LA CRÈTE ET L'EGYPTE

MÉTHODE

Rendant possible la prolongation jusqu'à l'Afrique de l'Arc de Méridien de l'Océan Glacial à la Mediterranée (20° - 25° Est de Greenwich) communiquée à la Séance du 6 Avril 1931

DE L'

ACADÉMIE D'ATHÈNES

par

LE PROF. DIPL. ING. **DÉM. LAMPADARIOS**

(Cette méthode a été présentée et adoptée par la 3ème Assemblée de l'Union Internationale Géodésique et Géophysique tenue à Stockholme le 23 Août 1930).

Extrait des Comptes - rendus de l'Académie d'Athènes
1931 Avril - 6. p. 204.

qui forment, au moment de la prise de la photographie, les 6 visées du

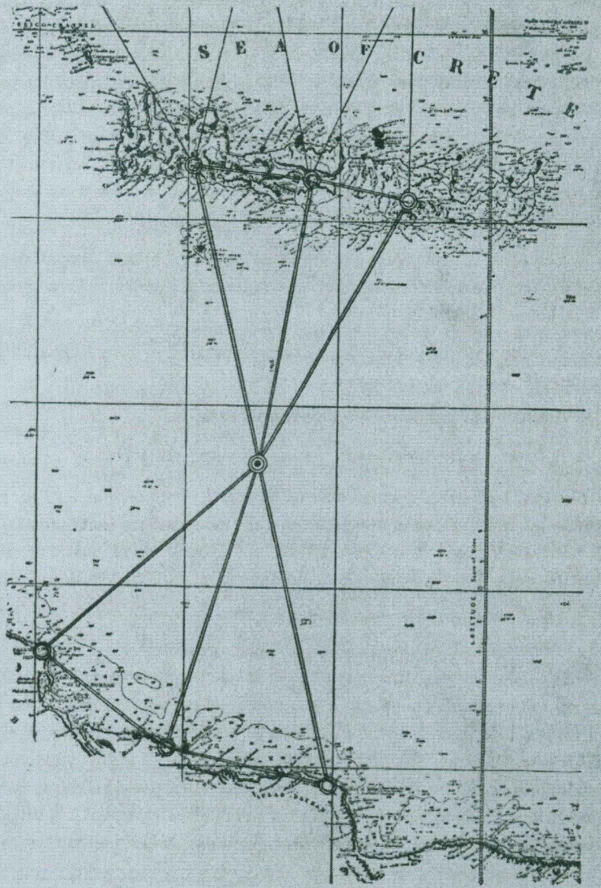


Fig. 2

point de l'espace vers les 6 points géodésiques terrestes.

2. **La chambre métrique double pour avion** (Fig. 3) se compose de deux chambres photogoniométriques placées de manière qu'on puisse photographier simultanément sur la même plaque. Cette plaque aura une épaisseur de 4 à 5 mm, avec les deux surfaces exactement parallèles, couvertes d'une émulsion spéciale et très sensible. Les objectifs de cette chambre métrique double seront identiques, de mêmes dimensions, très lumineux et posés sur le même axe; ils auront la même distance focale de 33cm et une ouverture de 1: 4,5 environ.

Les deux chambres seront munies chacune d'un obturateur central système «Compure»; les deux obturateurs seront construits de façon à ce qu'ils puissent fonctionner simultanément.
Les chambres possèderont en outre un dispositif de sûreté qui empêchera d'armer l'obturateur si le magasin n'est pas pressé contre les cadres métriques principaux. La rapidité de 1/150 de seconde sera suffisante.

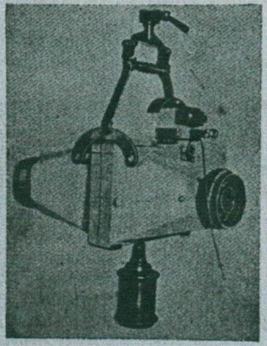


Fig. 3. — *La chambre métrique double pour avion.*

Le dispositif de suspension se composera d'un appareil de cardan. L'inclinaison de la chambre métrique double dans l'espace sera déterminée par un dispositif spécial permettant de photographier simultanément l'horizon aux deux directions opposées; par un viseur à prisme, l'observateur pourra regarder en même temps suivant les deux directions opposées aux deux chambres métriques et contrôler si les objets à photograqhier se trouvent dans le champ de chaque appareil. Dans le cas contraire, l'observateur pourra faire pivoter la chambre métrique double autour de l'axe vertical afin d'obtenir son orientation nécessaire.

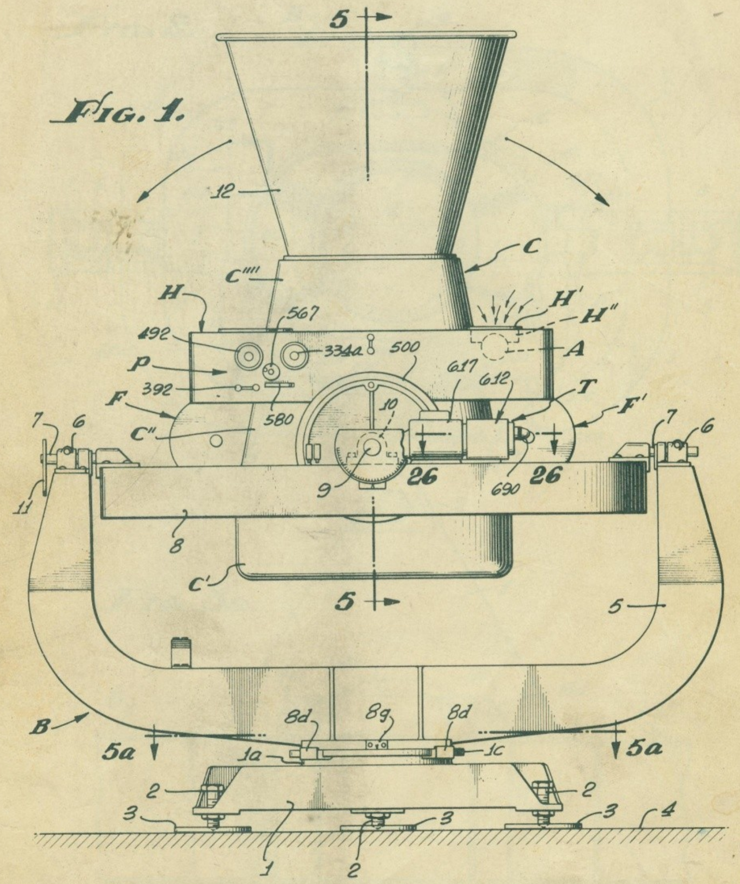
3. **Le photogoniomètre.** —(Fig. 4). Cet instrument permet la détermination rapide et précise des angles d'ouverture entre les repères des chambres métriques (détermination des constantes de la chambre) sans aucun calcul. A l'aide du même instrument, on pourra déterminer les angles horizontaux entre les visées représentées par les points photographiés. Le photogoniomètre sera muni de deux microscopes à vis micrométrique avec une estimation d'une seconde (1'').

Feb. 18, 1964 J. NUNN 3,121,605

TRACKING AND PHOTOGRAPHIC APPARATUS

Filed Sept. 22, 1958 31 Sheets-Sheet 1

FIG. 1.

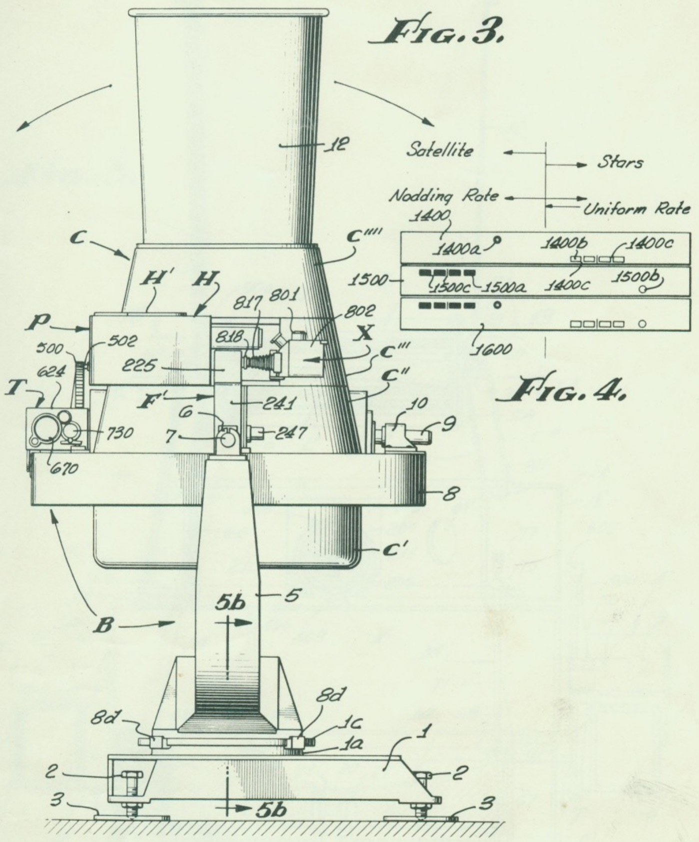


INVENTOR.
JOSEPH NUNN
BY
Paul A. Weilein
ATTORNEY.

Feb. 18, 1964 J. NUNN 3,121,605

TRACKING AND PHOTOGRAPHIC APPARATUS

Filed Sept. 22, 1958 31 Sheets-Sheet 3



INVENTOR.
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Feb. 18, 1964 J. NUNN 3,121,605

TRACKING AND PHOTOGRAPHIC APPARATUS

Filed Sept. 22, 1958 31 Sheets-Sheet 19

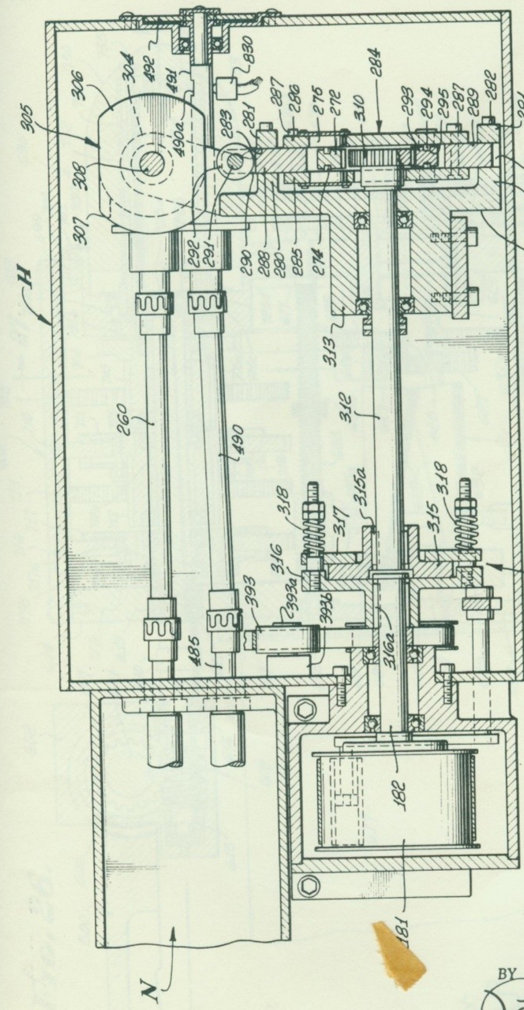


FIG. 25.

INVENTOR.
JOSEPH NUNN

BY Paul A. Weilein
ATTORNEY.

the uniform tracking drive to effect oscillation of the camera body about the axis of rotation thereof during tracking of a satellite. In accordance with this objective, the oscillating motion preferably alternates in that the tracking motion is alternately augmented and diminished by the oscillating motion, during a selected time interval.

Still another object is to provide interrelated, variable tracking drive and nodding drive mechanisms as aforesaid, including a unique means for maintaining at a constant velocity the nodding or oscillating movement of the camera body during the two phases of the nodding motion just referred to above.

Pursuant to the next preceding object, it is a further object to provide shutter mechanism operated in timed relation to the means for maintaining an angular velocity of the camera, whereby the film will be exposed during the uniform nodding or oscillating movement of the body, notwithstanding intermittent variations in the nodding or oscillating velocity of the camera body during other periods.

A still further object of the invention is to provide a camera having an $f/1.0$ optical system including an aspherical corrector cell, a spherical mirror disposed in spaced relation to the corrector cell, and interposed therebetween an aspherical focal surface, across which the film is adapted to be passed, in the pursuance of the instant invention, the optical system is perferably a modification of a classical Schmidt system, wherein the corrector cell is a multiple lens assemblage and the relationship is such that the corrector cell has a diameter on the order of about 22 inches, the mirror being about 31 inches in diameter with a 40 inch radius of concavity, the focal surface being on a radius of approximately 20 inches.

Generally, it is a further object to provide an optical system for a camera, wherein means are provided for focusing an image on a focal surface, said forming means being adjustable relative to the focal surface to effect such focusing; and while in the illustrative embodiment there is shown a modified classical Schmidt $f/1.0$ optical system, it will be understood that other optical systems may be employed without departing from the purview of the invention. In the ensuing description moreover, where a "corrector" cell is referred to, it should be understood that features of the invention are applicable to multiple lens assemblages other than corrector cells, and that, therefore, reference is made to the corrector cell as shown for the purpose of facility and is not made in a limiting sense.

Yet another object is to provide an optical system for a camera, as aforementioned, wherein the mirror is adjusted relative to the focal surface for effecting focus of an image upon the focal surface, the mirror being freely supported by means including adjuster devices which are so constructed and composed of such materials that temperature variations will not alter the focus of the mirror once it has been established.

A further object is to provide an optical system for a camera, as aforementioned, wherein the mirror or other image focusing means is freely supported and is substantially fully counterbalanced so as to facilitate adjustment of its position relative to the focal surface aforementioned by means of the adjuster devices.

Still another object is to provide a camera having an optical system of the aforementioned type wherein the corrector cell is composed of three lenses disposed in opposed relation and supported about their outer periphery in a novel manner, such that expansion and contraction of the respective lens elements of the corrector cell does not cause aberration or otherwise adversely affect the optical system.

Another object is to provide a camera including a spherical mirror and an aspherical focal surface disposed in spaced relation to the mirror in combination with means for transporting film across the focal surface and for tensioning the film so that the film is caused to conform to the aspherical focal surface configuration, thus to further reduce distortion of the image being photographed.

Yet another object is to provide film transport means for a camera including novel rack and pinion feed means for effecting the feed of film from a supply magazine to a take-up magazine, intermittently in timed relation to operation of the shutter mechanism, while tensioning the film across the focal surface or film back-up plate of the camera during exposure of the film. In accordance with this objective it is a further object to provide camera film feed and shutter mechanisms of the just-mentioned types, which are jointly operated in timed relation to mechanism for imposing upon a uniform angular tracking motion of the body of the tracking camera, a uniform velocity oscillation, the resultant movement of the camera being at a constant velocity during two phases of a cycle of the apparatus, and the shutter means functioning during the constant velocity phases of the respective cycles to expose the film while the film is tensioned.

Another object is to provide novel shutter mechanism for a camera including a comparatively fast shutter and a slow shutter jointly driven by a variable speed transmission at predetermined different rates, the fast shutter operating to intermittently interrupt exposure of a film strip while the slow shutter is open. In accordance with this objective, the respective shutters are disposed coaxially, the fast shutter including an assemblage of circumferentially spaced members rotatably disposed within the slow shutter, and the slow shutter comprising a clamshell assemblage disposed about the fast shutter.

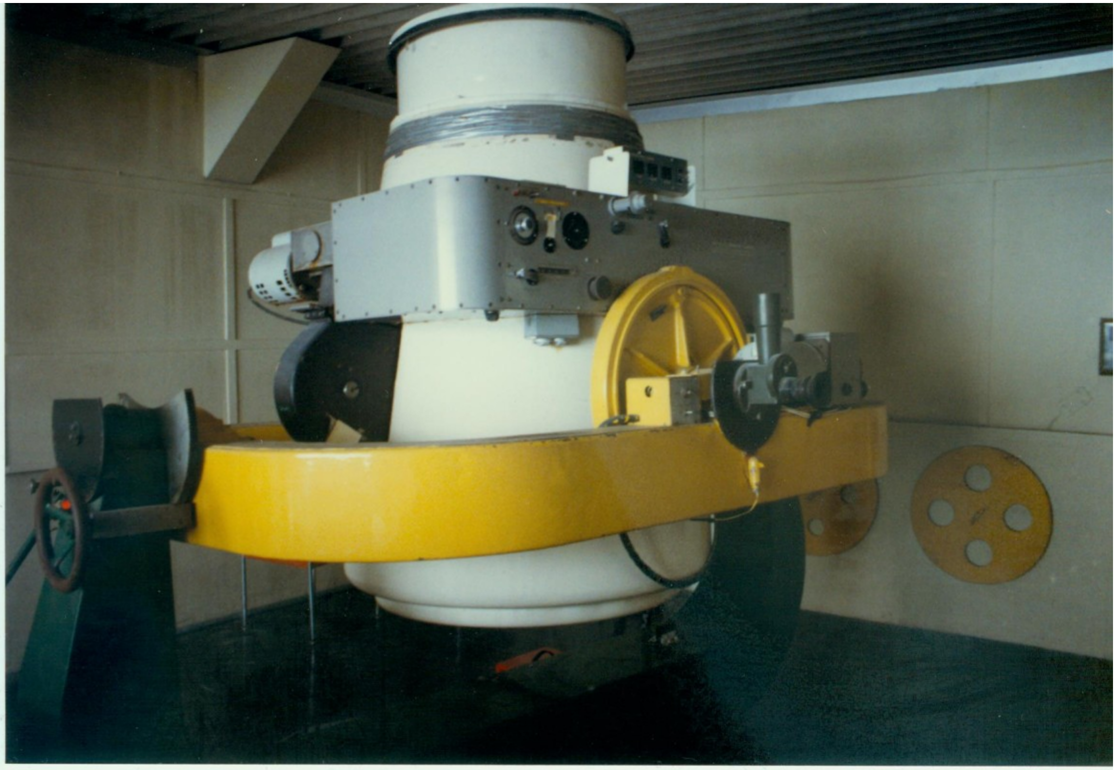
A still further object is to provide novel power transmission mechanism for driving a compound shutter mechanism or the like, including means whereby manual rotation of a control member projecting from the transmission housing through a series of revolutions will effect a setting of the transmisison for driving the compound mechanism at different rates and further including means for indicating exteriorly of the transmission housing the condition of the compound mechanism.

Yet another object is to provide power transmission mechanism as aforesaid in combination with means for effecting nodding or oscillation of a tracking camera wherein the oscillating velocity varies as a function of variation in the speed of operation of the transmission mechanism.

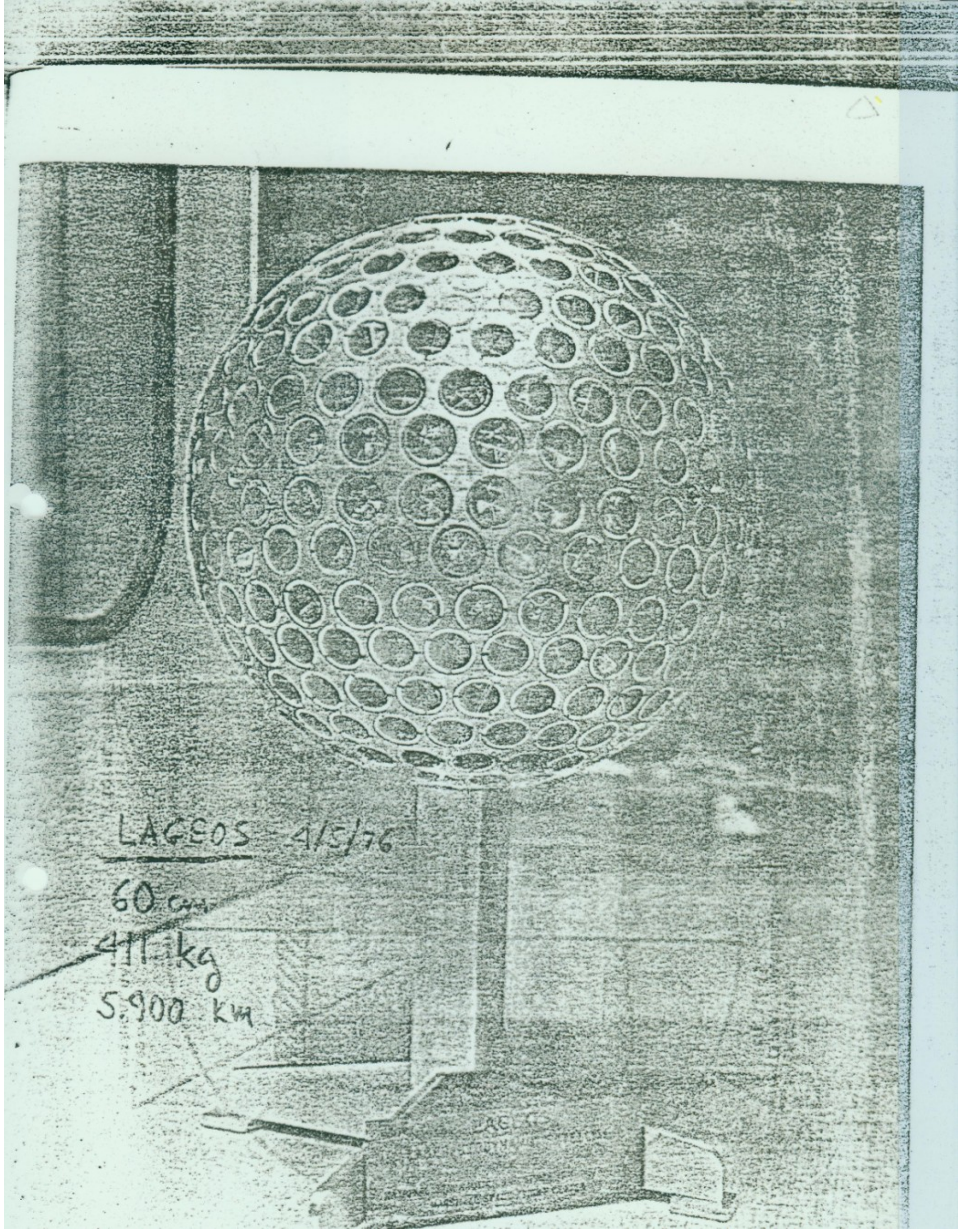
Another object is to provide a tracking camera or the like, including a body and means for effecting compound angular movement of the body, such as by the imposition of an oscillating or nodding motion over a selected uniform angular motion, wherein power driven transmission means are provided for effecting the compound motion through a predetermined range of angular velocities, but wherein manual means are provided for effecting operation of the transmisison means for enabling manual tracking of the camera.

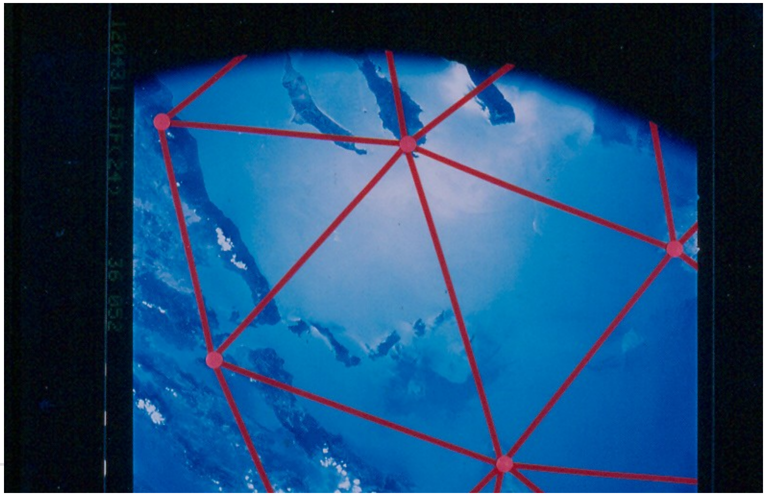
Inasmuch as in a satellite tracking camera it is necessary to determine time of exposure of the film within a very close time period, say on the order of one millisecond in order to obtain the desired accuracy, it is still another object of the invention to provide means for projecting onto the film strip or frame being exposed a time presentation. In this connection, a slave clock powered by a source of constant frequency is employed. This clock, in conjunction with a sweep oscilloscope, being adapted to indicate time to $\frac{1}{10}$ of a millisecond, and being illuminated so as to expose the film by the firing of a stroboscope lamp under the control of the mechanism which drives the shutter mechanism.

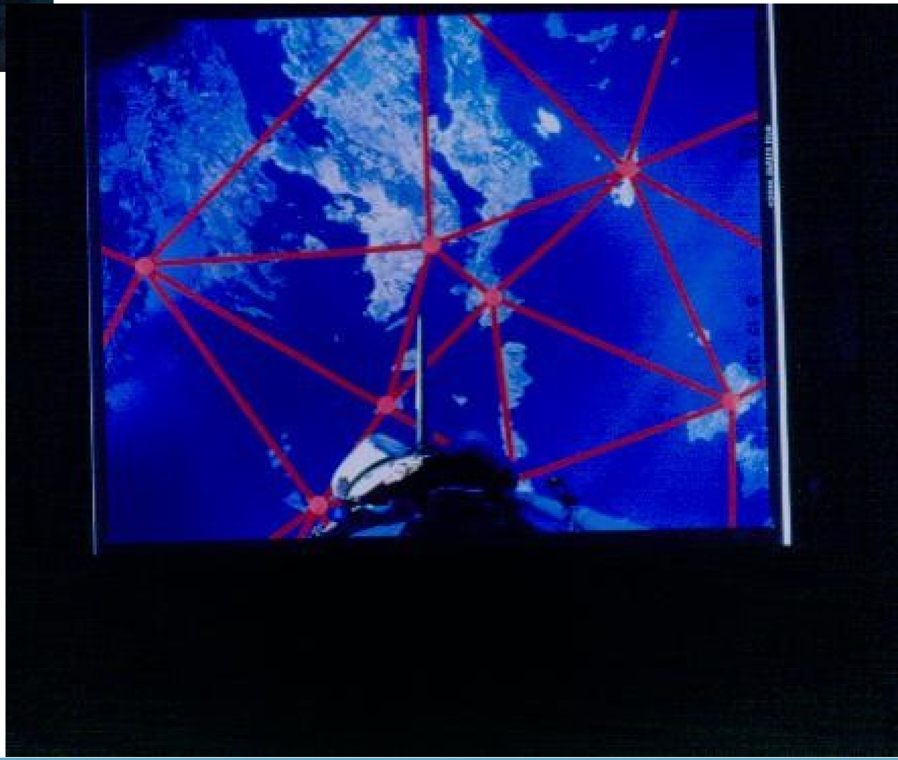
In addition, it is an object to provide time presentation means in accordance with the next preceding objective, wherein external indicating means are employed for showing the position in the cycle of operation of the camera at which exposure takes place and the position at which the stroboscope lamp is fired to illuminate the slave clock to indicate the midpoint of exposure of the film strip ac-

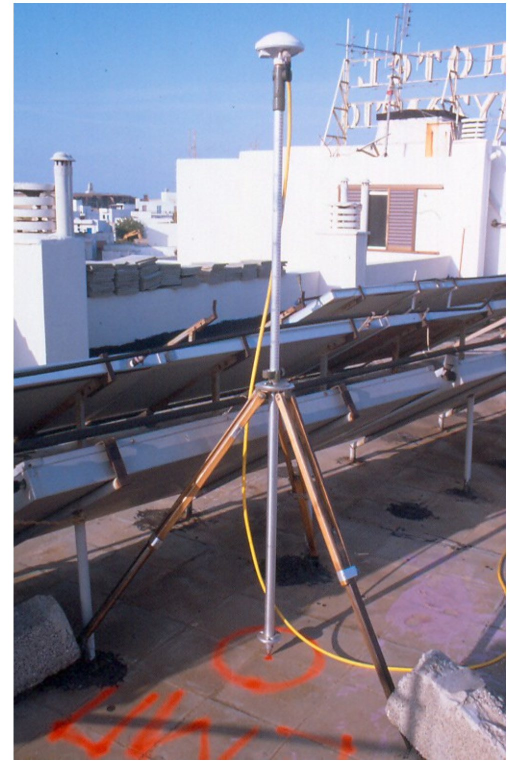


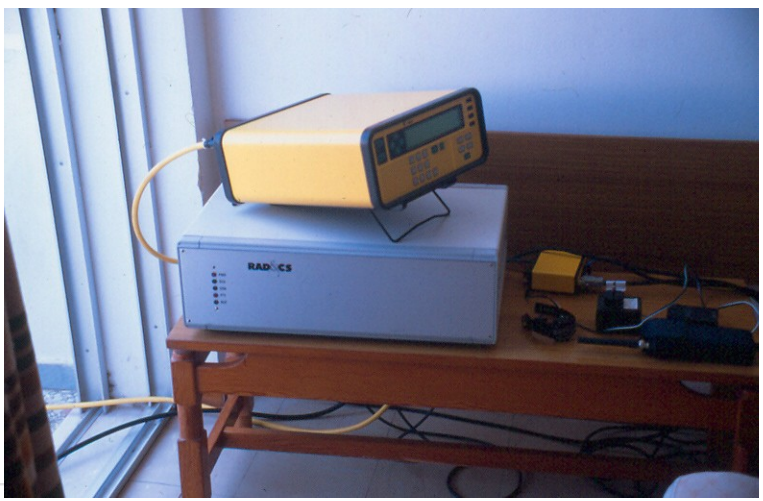

quantel


LAGEOS 4/5/76
60 cm
411 kg
5.900 km










WTLRS

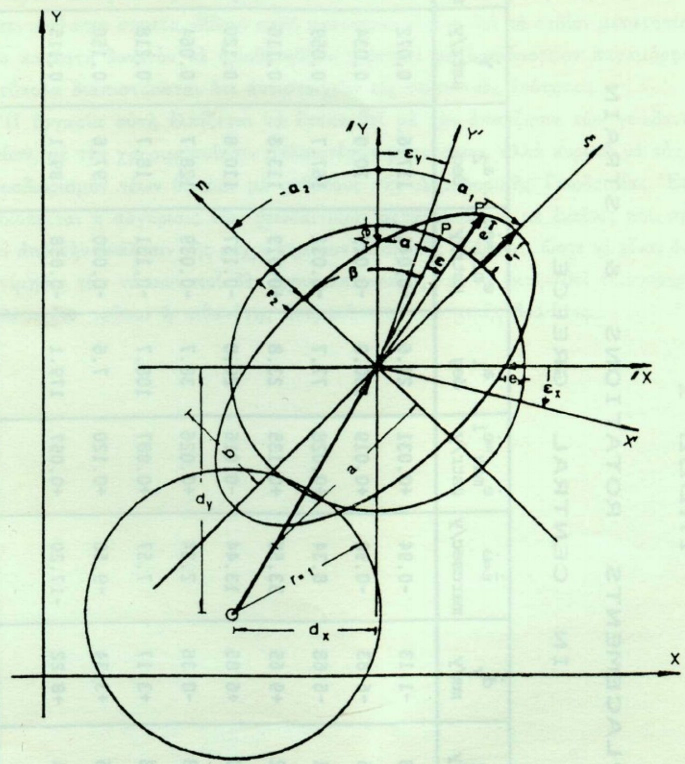


Fig. 1. The strain ellipse.

TABLE I

DISPLACEMENTS ROTATIONS & STRAIN IN CENTRAL GREECE

Block (n)	σ_o mm/y	$\dot{d}_x$ mm/y	$\dot{d}_y$ mm/y	$\dot{\varepsilon}=\dot{\omega}$ marcsec/y	$\dot{e}_{max}=\dot{e}_1$ μstr/y	a_1 deg	$\dot{e}_{min}=\dot{e}_2$ μstr/y	a_2 deg	$\dot{\gamma}$ μstr/y	$\dot{\gamma}$ marcsec/y
A (11)	1.30	-1.43	-1.13	-0.94	+0.031	27.6	-0.041	117.6	0.072	14.75
B (16)	1.55	-1.65	-6.83	-0.90	+0.019	100.0	-0.015	10.0	0.034	7.0
C (5)	0.40	-8.21	-6.68	8.34	+0.028	77.7	-0.032	167.7	0.059	12.2
D (4)	3.41	-0.12	+9.65	33.55	+0.135	23.8	+0.019	113.8	0.116	23.9
E (8)	2.61	+6.60	+6.85	13.44	-0.016	20.8	-0.137	110.8	0.120	24.7
F (12)	1.69	+2.78	-0.36	2.34	+0.026	38.7	-0.039	128.7	0.064	13.2
G (4)	1.19	-7.03	+3.17	7.57	+0.087	108.7	-0.131	18.7	0.218	44.8
H (3)	--	-2.45	+3.34	-9.58	+0.120	7.6	-0.030	97.6	0.150	31.0
K (8)	4.00	+2.21	+8.22	-17.20	+0.057	179.1	-0.058	89.1	0.115	23.7

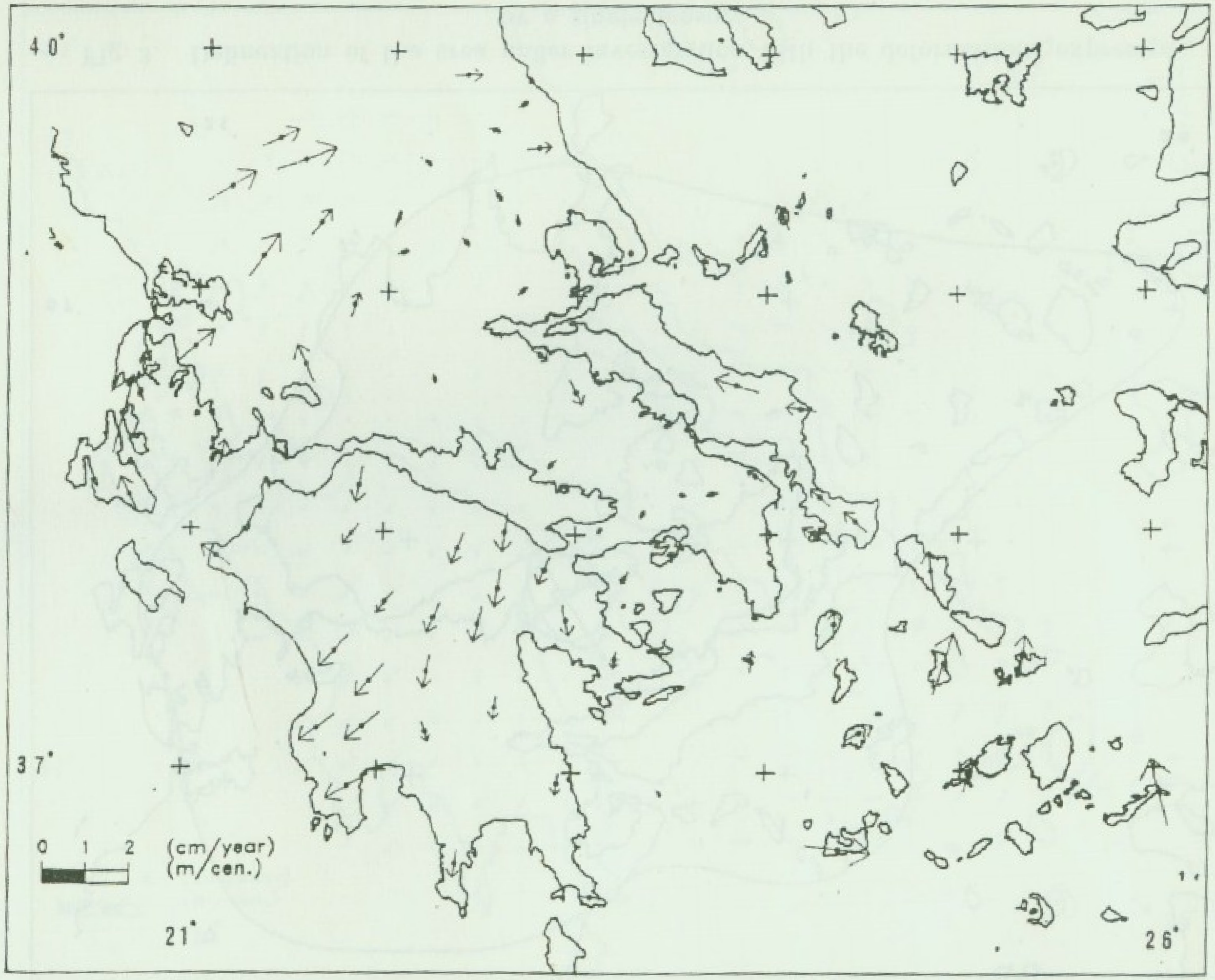


Fig. 2. The directly observed displacement vectors. The length of the vectors correspond to the displacement at the map scale over a period of 2 My.

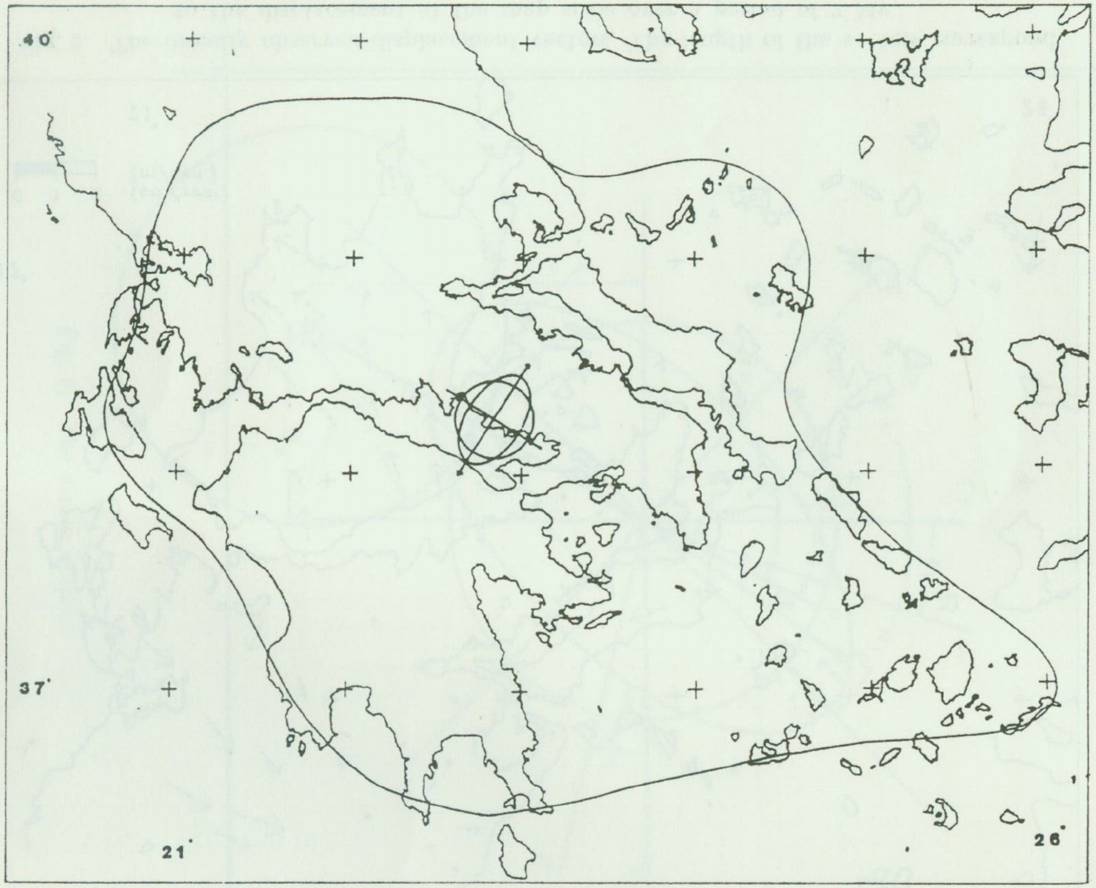


Fig. 3. Delineation of the area under investigation with the deformations expressed by a single tensor.

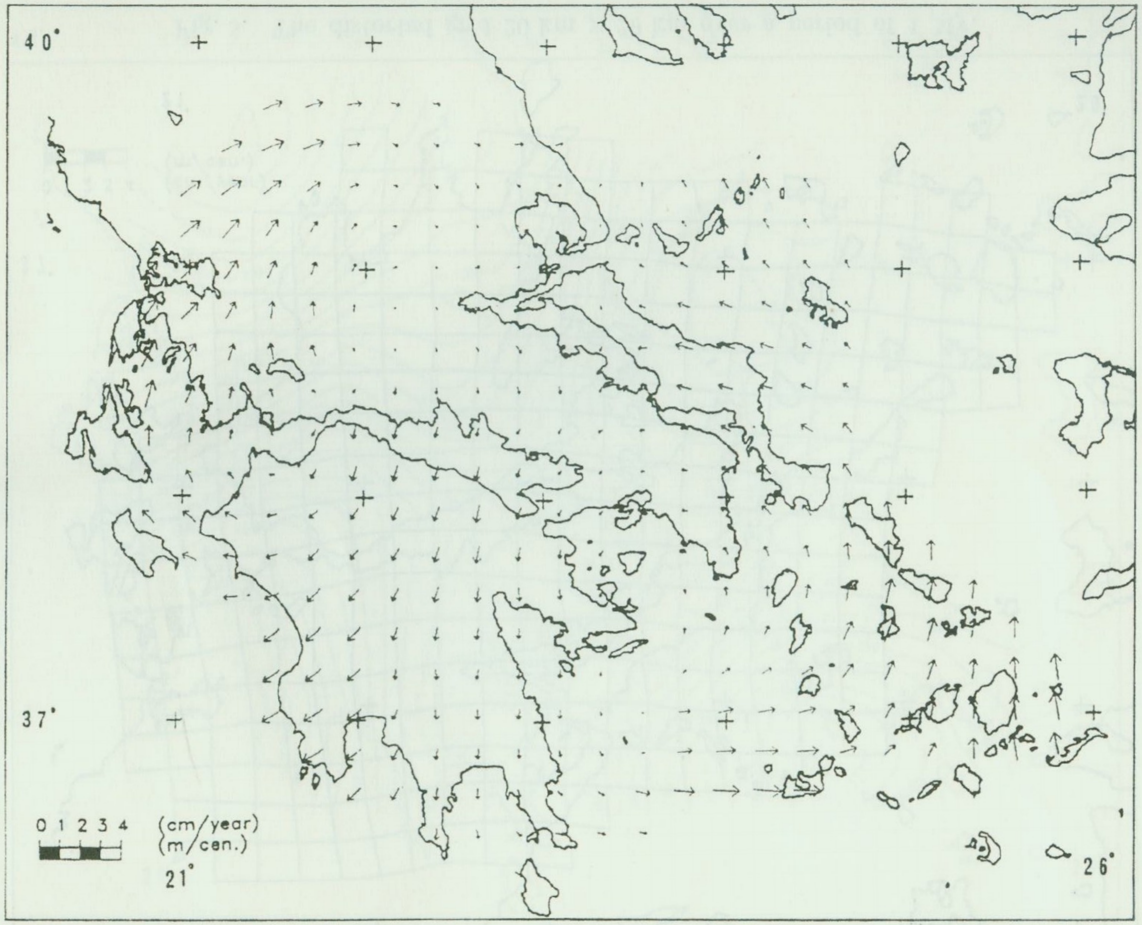


Fig. 4. The displacement field derived by interpolation from the observed displacements. The vectors correspond to the displacements at the map scale over a period of 1 My.

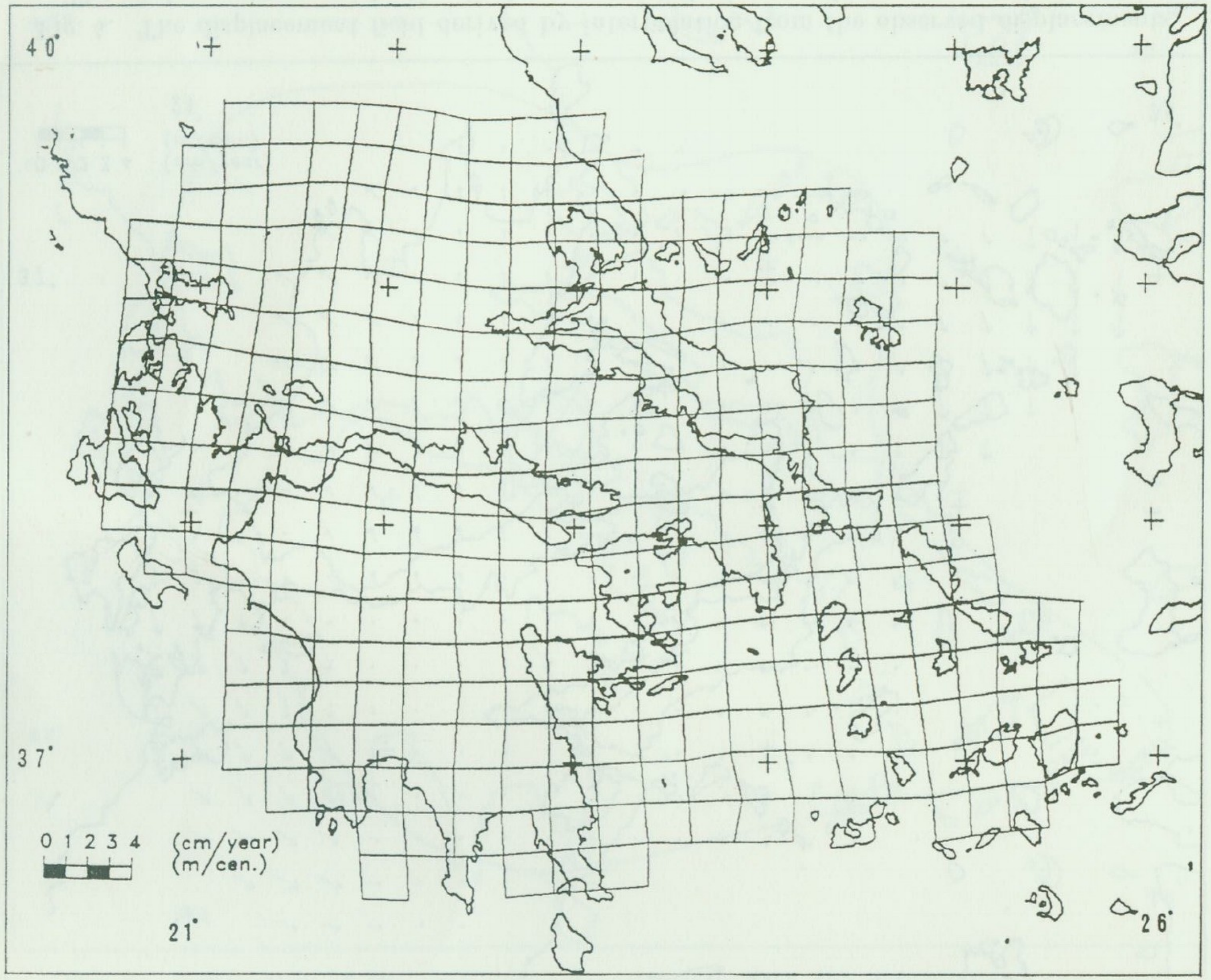


Fig. 5. The distorted grid 20 km × 20 km over a period of 1 My.

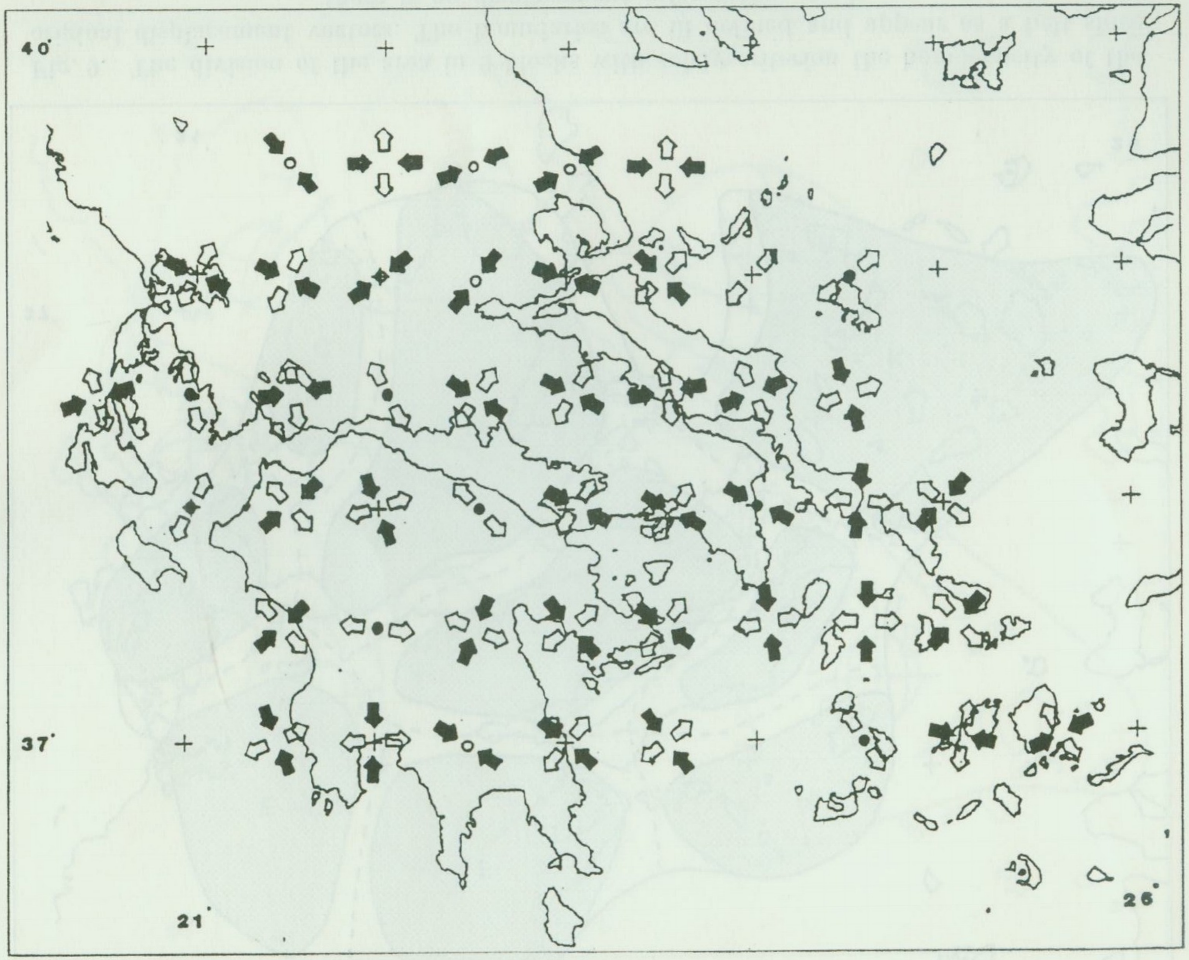


Fig. 8. The principal axes of strain obtained by scanning in half degree step both in latitude and longitude.

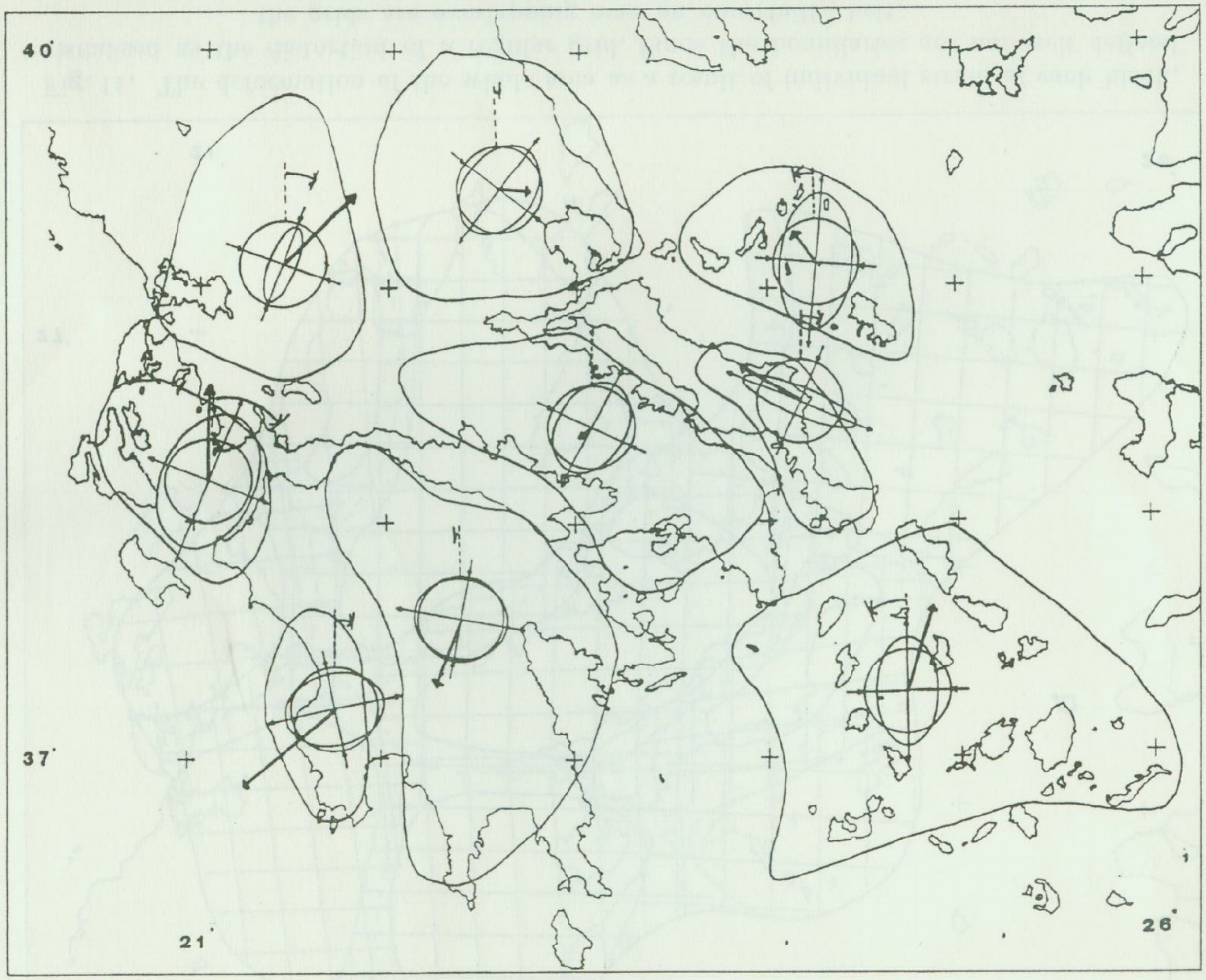
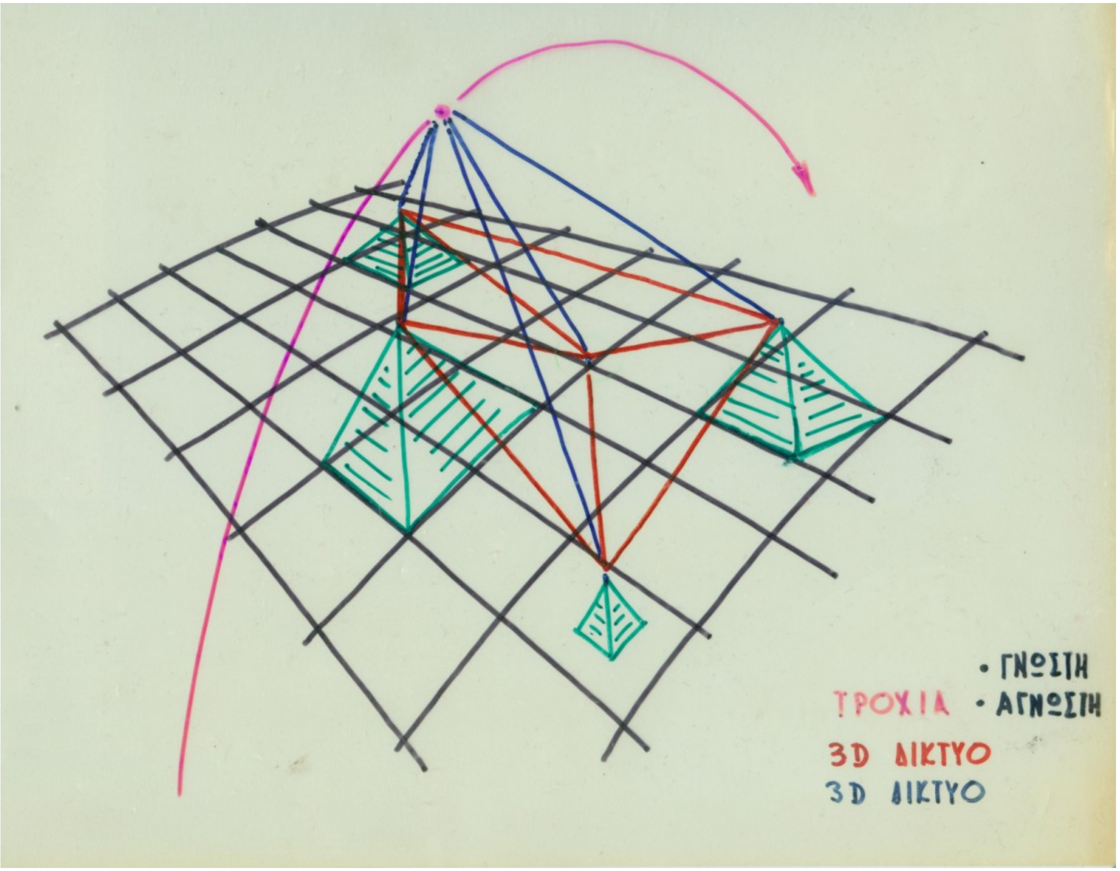
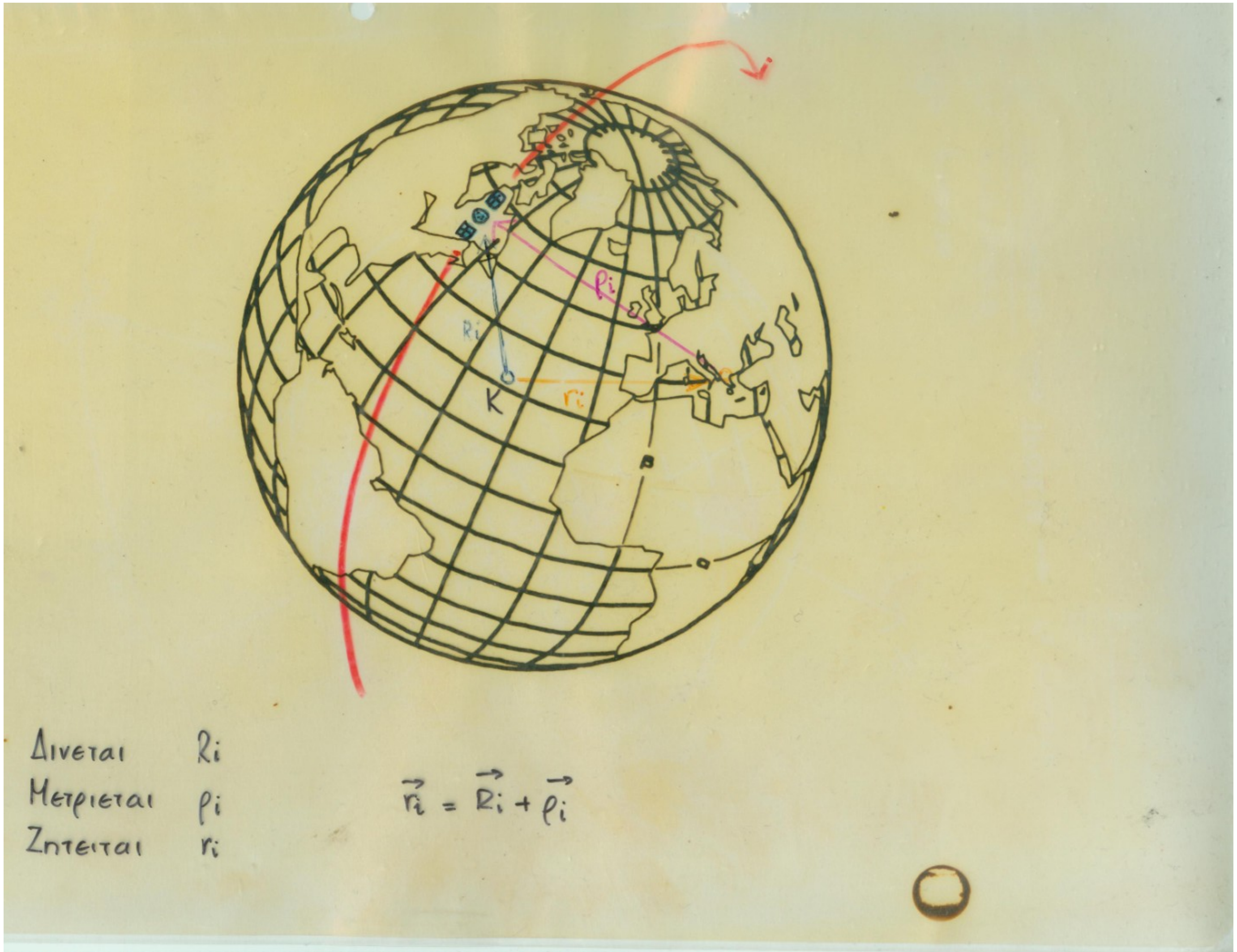
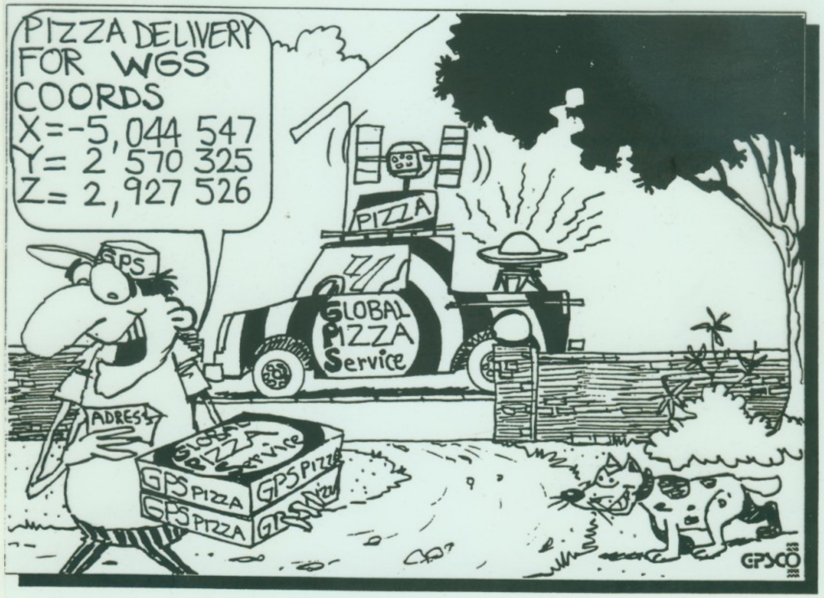


Fig. 10. The complete local strain tensor for each block presented as a block displacement, rotation and a strain ellipse. They are drawn to the map scale as they will correspond in 5 My.


• ΓΝΩΣΤΗ
ΤΡΟΧΙΑ • ΑΓΝΩΣΤΗ
3D ΔΙΚΤΥΟ
3D ΔΙΚΤΥΟ


ρi
Ri
K
ri
Δινεται Ri
Μετριεται ρi
Ζητειται ri
ri = Ri + ρi



GPS

Global Pizza