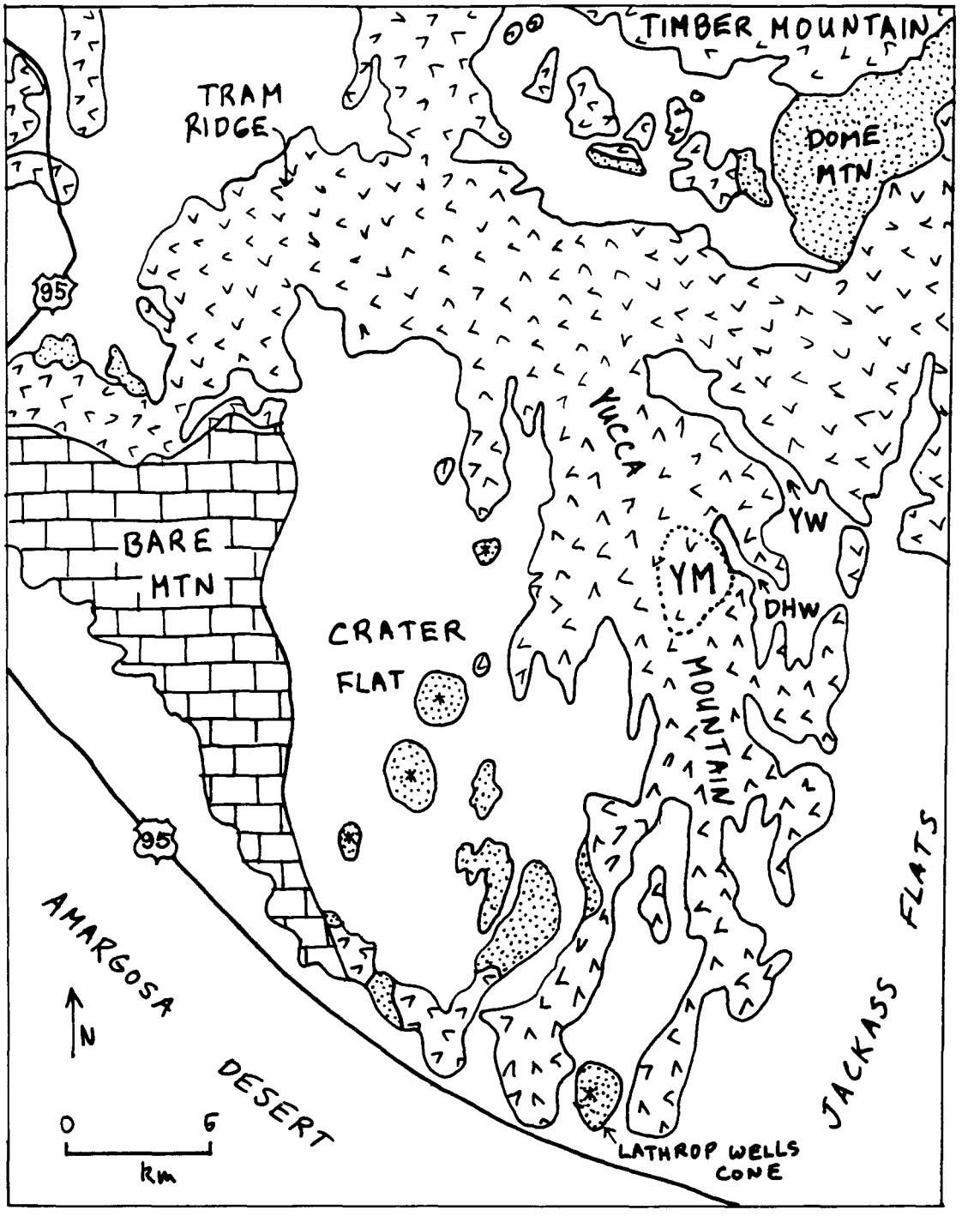
INTEGRATED STRUCTURAL MODEL OF THE YUCCA MOUNTAIN REGION

Chris Fridrich, USGS



OUTCROP MAP OF YUCCA MOUNTAIN REGION

Photo:

Wide-angle view across Crater Flat

Photo:

Angular unconformity in the late Miocene tuff section in Crater Flat basin

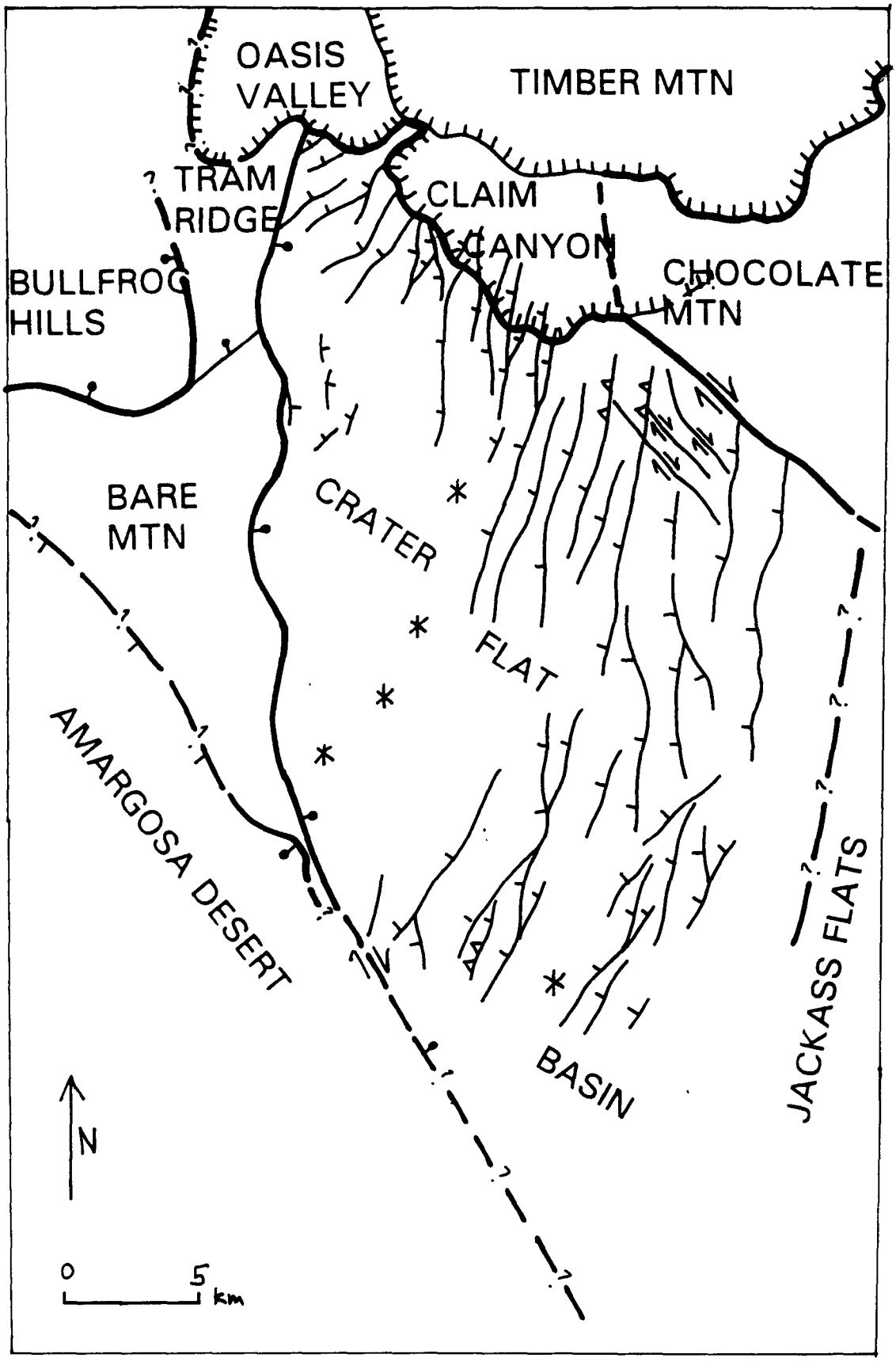
DEFINITIONS

STRUCTURAL DOMAIN:

AN AREA IN WHICH ALL STRUCTURAL CHANGES ARE GRADUAL AND SYSTEMATIC, SUCH THAT THE AREA CONSTITUTES A LOGICAL WHOLE

STRUCTURAL DOMAIN BOUNDARY:

A ZONE ACROSS WHICH AN ABRUPT, FUNDAMENTAL CHANGE OCCURS IN STRUCTURAL STYLE, % EXTENSION, AND/OR TIMING OF DEFORMATION



STRUCTURAL DOMAIN BOUNDARIES OF THE YUCCA MOUNTAIN REGION

MAJOR FEATURES OF CRATER FLAT BASIN:

- FAULT PATTERNS: Radial E-W, Curving N-S
- % EXTENSION ↑ S and W;
- LOW % EXTENSION THROUGHOUT
- ASYMMETRY
- ROLLOVER STRUCTURE
- EXTENSION MIGRATED E-W FROM 14-9 Ma

ALL CHANGES GRADATIONAL; ONE DOMAIN

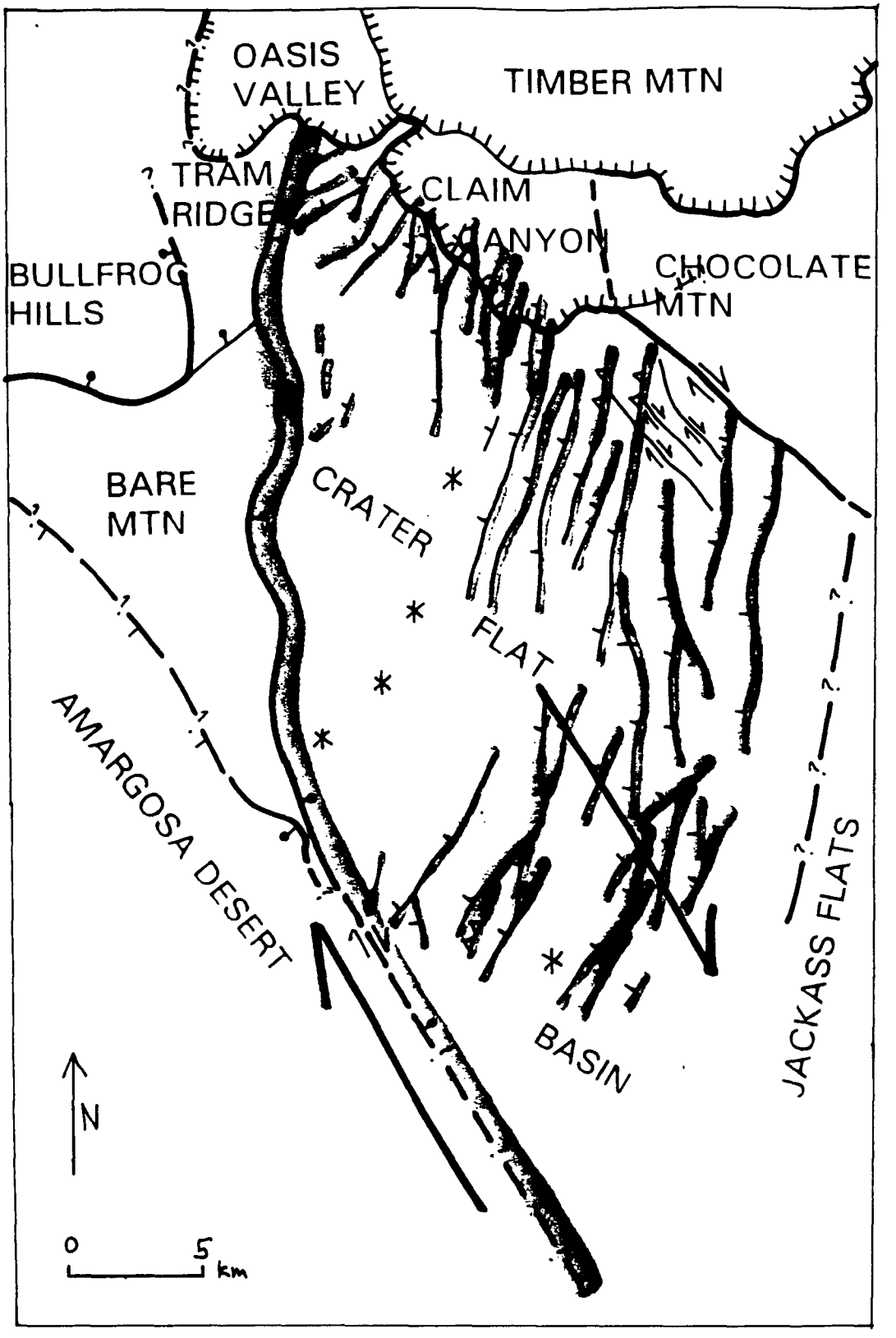
FEATURES OF CRATER FLAT BASIN INDICATING STRIKE-SLIP SHEAR:

- OROFLEXURAL BENDING
- LEFT OBLIQUE SLIPS ON N-TRENDING FAULTS
- SCISSORS FAULTING
- NW-TRENDING RIGHT-SLIP FAULTS

PHOTO:

AEROMAGNETIC SURVEY RESULTS

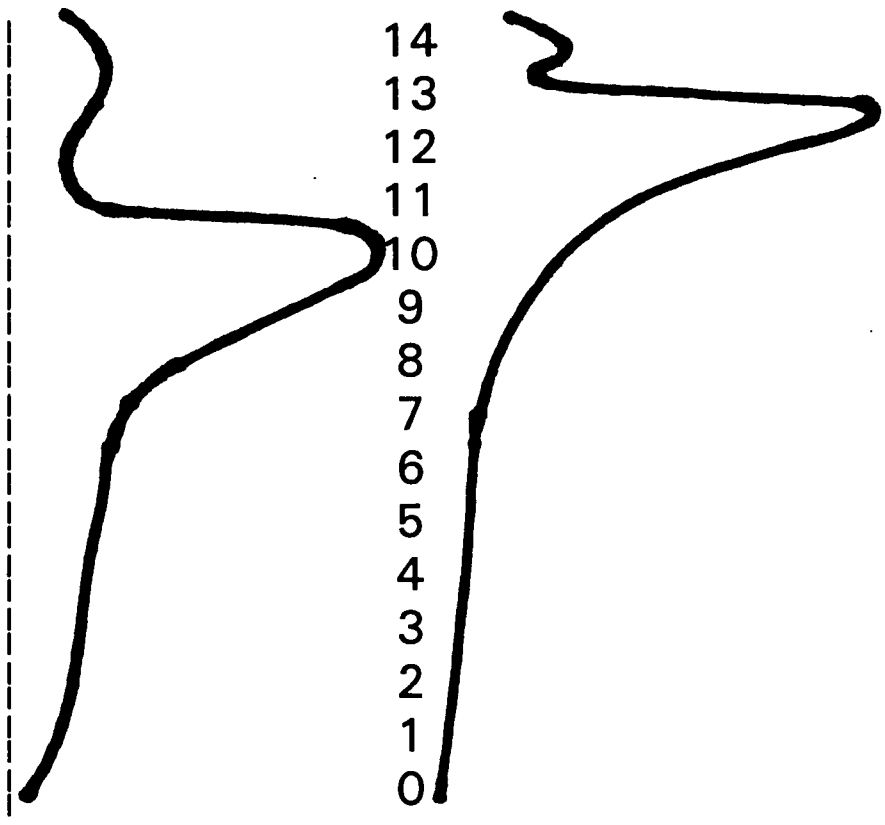
IN THE CRATER FLAT REGION



3 MAJOR STRUCTURAL FEATURES OF CRATER FLAT BASIN: RANGE-FRONT FAULT, ANTITHETIC FAULTS, AND ZONE OF STRONG DEXTRAL SHEAR ALONG THE SOUTHWESTERN BOUNDARY

EXTENSIONAL EVOLUTION OF CRATER FLAT BASIN

AGE	DIR
14-13 Ma	ENE
13-12.5 Ma	N
12.5-11.6 Ma	N
11.45-11.6 Ma	N
~10-11.45 Ma	N
~9-10 Ma	N
~7-9 Ma	NW?
PLIO-QUAT.	N



FOUR MAPS SHOWING SPATIAL DISTRIBUTION OF EVIDENT EXTENSIONAL DEFORMATION FROM 14 TO 11.45 Ma

FOUR MAPS SHOWING SPATIAL DISTRIBUTION OF EVIDENT EXTENSIONAL DEFORMATION FROM 11.45 Ma TO PRESENT

MAJOR CONCLUSIONS:

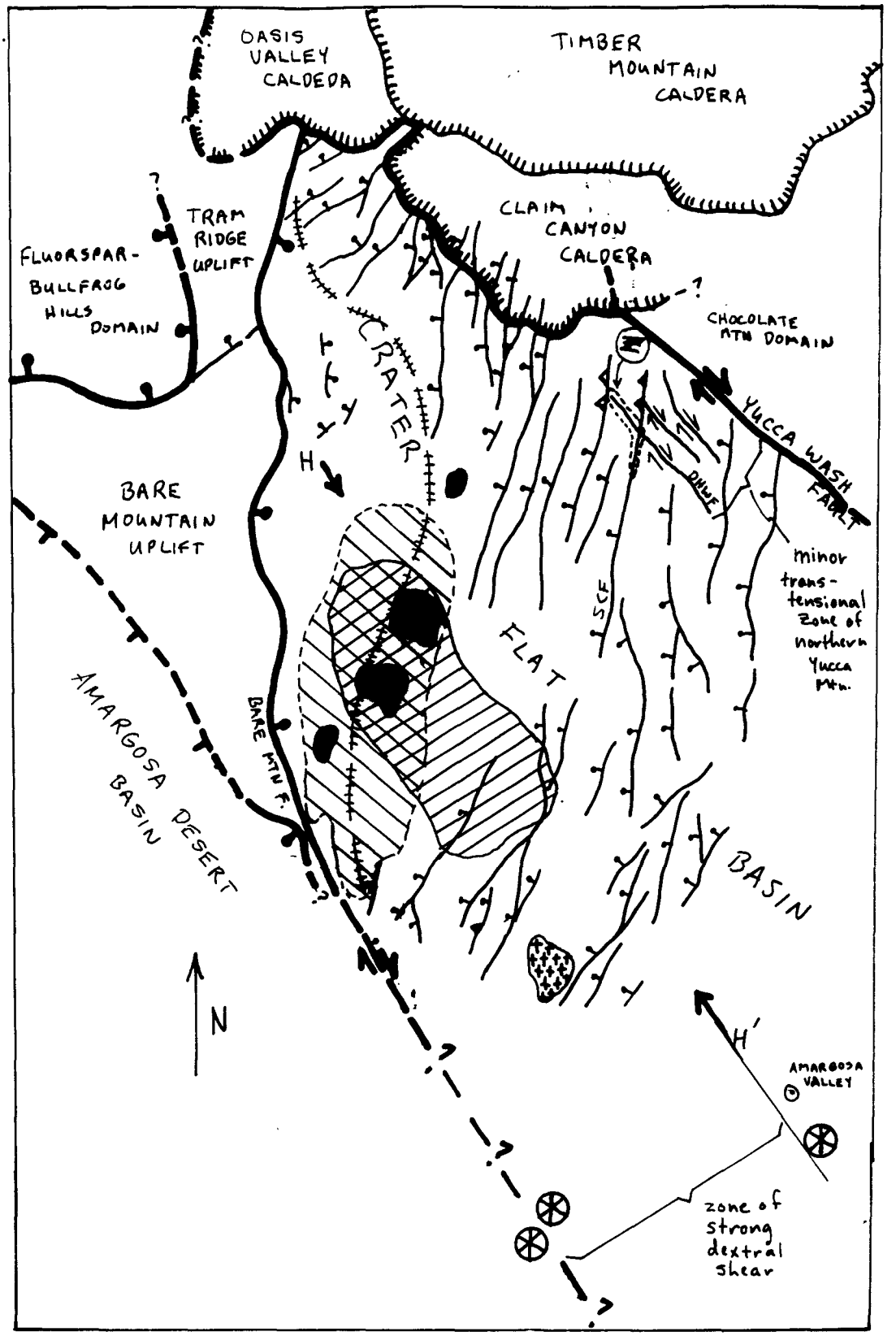
CRATER FLAT IS A HALF-GRABEN

BUT HAS MANY STRIKE-SLIP FEATURES

REGION IS SEGMENTED INTO DOMAINS

EXTENSION IN BELTS MIGRATED TO WEST, 14-9 Ma

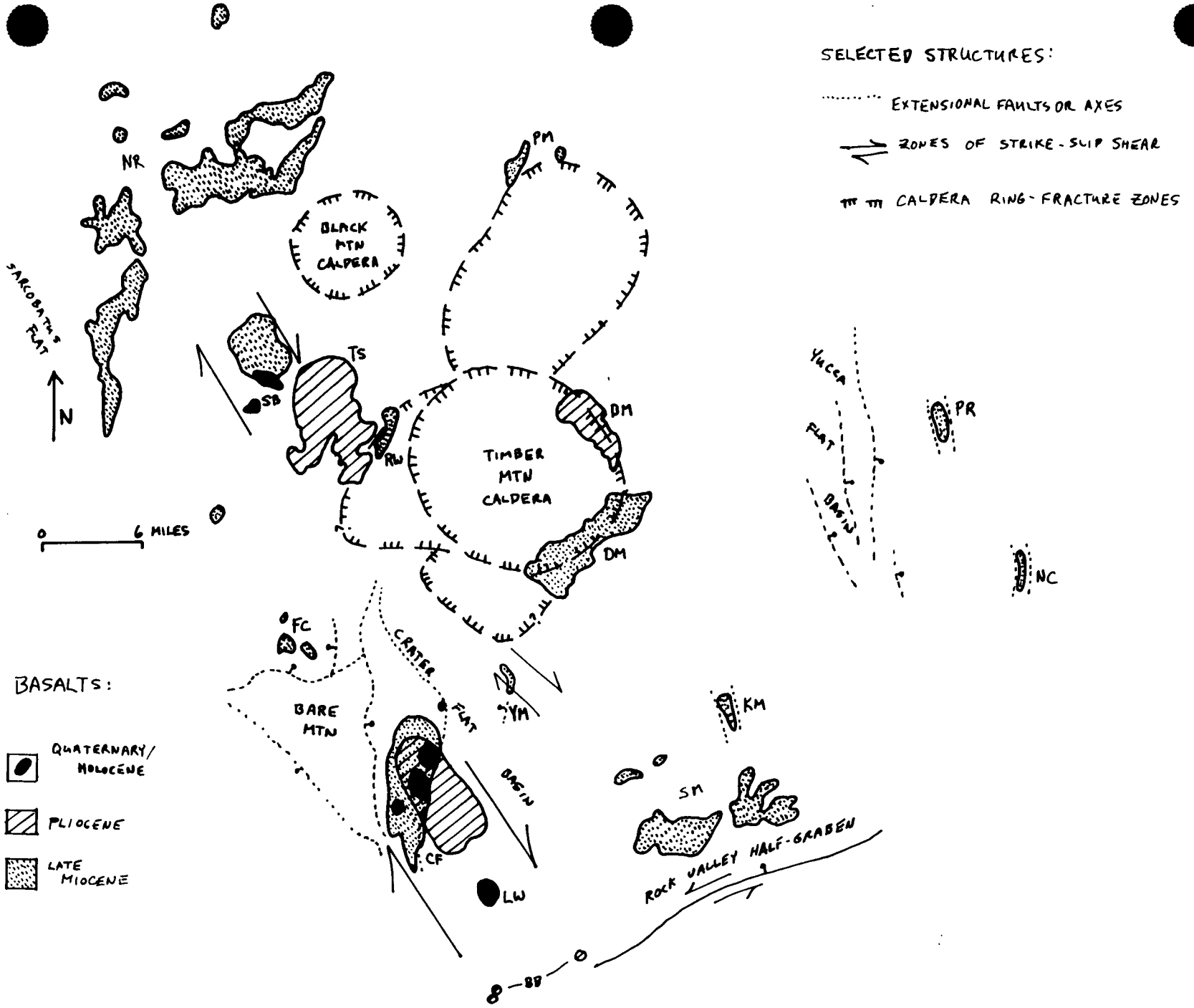
FAULTS ACTIVE NOW FORMED AT 12.5 Ma



STRUCTURAL SETTING OF CRATER FLAT BASALTS

PHOTO:

MAP SHOWING DIKES OF NORTHERN YUCCA MOUNTAIN



STRUCTURAL SETTING OF BASALTS IN THE SOUTHWEST NEVADA VOLCANIC FIELD

STRUCTURAL SETTINGS OF BASALTS

(1) CALDERA RING-FRACTURE ZONES

(2) STRIKE-SLIP SHEAR ZONES

(3) EXTENSIONAL STRUCTURES (?)

BASALT CLUSTERS ACTIVE TODAY:

(1) BOTH IN NW-TRENDING RIGHT-LATERAL STRIKE-SLIP SHEAR ZONE(S)

(2) BOTH WERE ACTIVE AT ~10 Ma, ~4 Ma, AND $\leq$1 Ma

(3) BASALTS OF N YUCCA MTN IN ANOTHER RIGHT-SLIP ZONE, BUT TRIVIAL AND DEAD SINCE 10 Ma

DETACHMENT MODEL OF YUCCA MTN APPARENTLY A FAILED HYPOTHESIS

(1) DIFFICULT TO RECONCILE WITH:

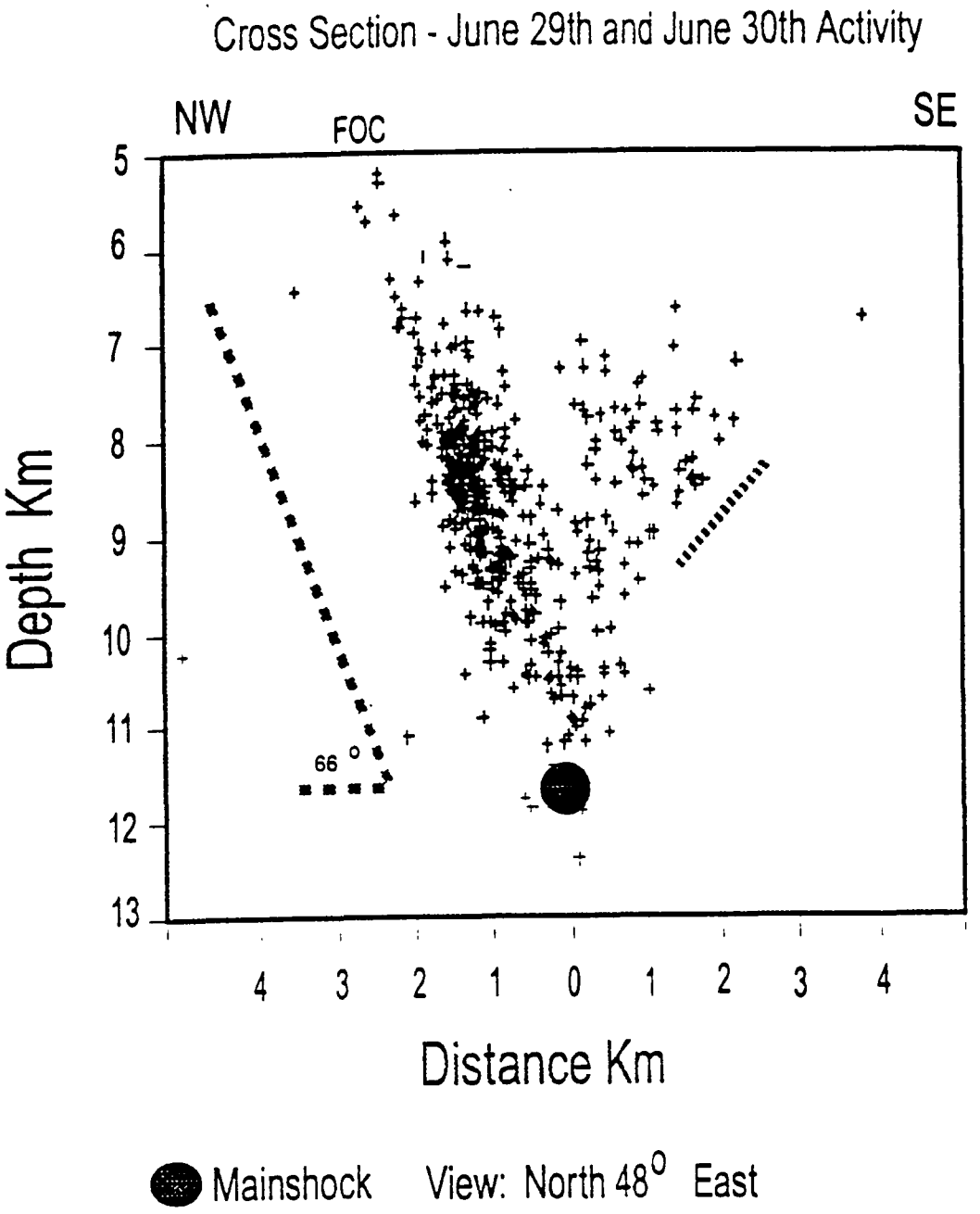
(A) GEOPHYSICAL DATA - CRATER FLAT GRAVITY, AMARGOSA SEISMIC

(B) SEISOMOLOGIC DATA (LITTLE SKULL MTN EARTHQUAKE JUNE 1992)

(2) MODEL FAILS RECENT TESTING:

(A) BARE MTN NOT A LATE UPLIFT

(B) PREDICTED TERT-Pz OFFSET AROUND BARE MTN NOT FOUND



LITTLE SKULL MOUNTAIN AFTERSHOCK PATTERN SHOWS SURFACE FAULTS ARE PLANAR AND EXTEND TO 10-15 km DEPTH (TO THE BRITTLE-DUCTILE TRANSITION)

IMPLICATIONS OF STRUCTURAL MODEL FOR:

SEISMIC HAZARD ASSESSMENT:

- o FAULTS ACTIVE IN THE QUATERNARY FORMED AT ~12.5 Ma; THE CHANCES OF A NEW FAULT FORMING THROUGH THE REPOSITORY ARE NIL

- o RATE OF EXTENSION HAS PROGRESSIVELY DECLINED SINCE 11.6 Ma; HOWEVER ACTIVITY MAY RISE AND FALL EPISODICALLY ALONG WITH VOLCANISM

VOLCANIC HAZARD ASSESSMENT:

- o QUATERNARY ERUPTIONS HAVE BEEN CONFINED TO A NARROW ZONE THAT DOES NOT INCLUDE THE REPOSITORY AREA; HENCE, STRUCTURAL CONTROL DECREASES CHANCE OF MAGMATIC DISRUPTION

- o NORTHERN YUCCA MOUNTAIN DIKE ZONE HAS BEEN INACTIVE SINCE 10 Ma; LIES IN AN INACTIVE STRUCTURAL ZONE