

## Lab 2: Time Series Image Interpretation (30 points)

### Materials

- Digital copies of the following aerial photos:

- 1929\_c-430\_a-5\_rot\_sub.tif
- 1938\_c-4950\_sf-19\_sub.tif
- 1947\_gs-em\_6-106\_rot\_sub.tif
- 1959\_output.jpg
- 1966\_hb-ju\_132\_rot\_sub.tif
- 1971\_hb-sj\_24\_rot\_sub.tif
- 1983\_pw-14635\_9-1\_rot\_sub.tif
- 2006\_LO-17193MOS2.tif

### Introduction: Time Series Analysis with Aerial Photos

A time series is a collection of similar images taken of the same location over time. We often use time series imagery in order to track and detect change over time. For example, we can use a time series of imagery before and after a natural disaster to identify areas with severe damage and to track post-disaster reconstruction.

In this lab, we will use a time series of aerial photos of UCSB's campus in order to identify and label changes over UCSB's history. When completing this lab, you may find it helpful to have a campus map or Google Earth open to help you identify changes.

### Part 1: Time Series Analysis of Aerial Photos over UCSB (24 points)

Before starting this lab: Download the Zip folder with the images associated with lab 2 from Gauchospace. Unzip the folder and make sure you can view each image. In the folder, you should see 8 images from the following dates. Use these images to answer the questions in Part 1.

- 1928
- 1938
- 1947
- 1959
- 1966
- 1971
- 1983
- 2006

The purpose of Part 1 of this lab is to identify changes using only aerial photography and to reconstruct a timeline of UCSB campus from that. Therefore, please answer all of the questions below using ONLY specific evidence that you can see in these photos and the fact that you know the dates when each photos was made. The explanations should all come from specific clues and changes that you find in the photos. Do not refer to any type of outside information or historical knowledge for your answers. We are only grading your responses based on what you see and identify, and your explanation of how you interpret those changes over time.

**Question 1:** What are some major differences you observe about the images themselves? Name at least 3. (This question refers to differences in the *characteristics* of the images themselves, not about differences in the environment depicted in the image) (3 points)

*The aircrafts involved in image recording varied in aerial velocity, altitude, field of view, and optical axes. This could be a result of technologic changes and photography methods over time.*

**Question 2:** Which images do you think were taken with a film camera? Which with a digital camera? Why? (2 points)

*Film Images: 1929, 1938, 1947, 1959, 1966, 1971, 1983*

*Digital: 2006, this photo is the only one after 1988, when the first digital camera was released to the public*

**Question 3:** What kind of development appears in the area at each time-step (period between each photo)? (7 points)

*1938-1947: War-time development, shaping agricultural lands into a military post and airfield*

*1947-1959: Educational development, transition from military post to a college campus*

*1959-1966: Urban development, more housing and infrastructure is built*

*1966-1971: Urban/Educational, UCSB is majorly developed, bringing more people and infrastructure*

*1971-1983: Transportation development, Roads, Bus loops, and parking lots are renovated/established*

*1983-2006: Infrastructure development, UCSB builds parking garages, and external campus housing/facilities*

**Question 4:** We know that before becoming a university campus, this area served as a military base. Using clues from the image, which period do you think that took place? What was happening in the world at that time? (2 points)

*Period: 1938-1947, World War II developed, forcing the U.S. to immensely develop military forces and infrastructure to train/provide sufficient forces*

**Question 5:** Using clues from the image, what period do you think the area became the UCSB campus? Why? (2 points)

*Following WWII, the UC system took ownership of the land and developed what is now the UCSB campus. By 1959, notable campus facilities, such as Robertson Gym, The competitive swimming pool and residence halls are built and occupied.*

**Question 6:** Based on your images, in what period do you think the University most invested in construction and expansion? Why? (2 points)

*Between 1983-2006, there was more construction and expansion due to rising population and impacts of the university as a world-class research facility*

**Question 7:** Using only your imagery, how old (approximately) is the Davidson Library? Try also to date the UCEN building, Ellison Hall, North Hall, Campbell Hall and the Storke Tower. (3 points)

**Davidson Library: ~61 years** - **North Hall: ~54**

**UCEN: ~54 years** - **Campbell Hall: ~54**

**Ellison Hall: ~49 years** - **Storke Tower: ~ 49**

**Question 8:** Based on your images, what was the land use in Isla Vista before it was developed? (1 point)

***Agricultural/Rural***

**Question 9:** In what period did the occupation of Isla Vista increase more rapidly? Use evidence from the image to support your answer. (2 point)

***Isla Vista developed more rapidly between 1959 and 1966, with much more housing in the square mile. The 1959 image also focuses on the development of the campus rather than Isla Vista.***

## Part 2: Viewing Historical Imagery in Google Earth (6 points)

Google Earth is a fantastic tool for viewing historical imagery. In this section, we will use Google Earth Timeline to view changes in the hills above Santa Barbara. Note: This is not available on the browser version of Google Earth. If you are unable to use the Desktop version of Google Earth, please contact your TA for alternative instructions for this question.

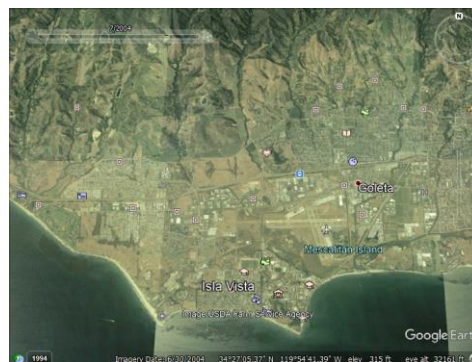
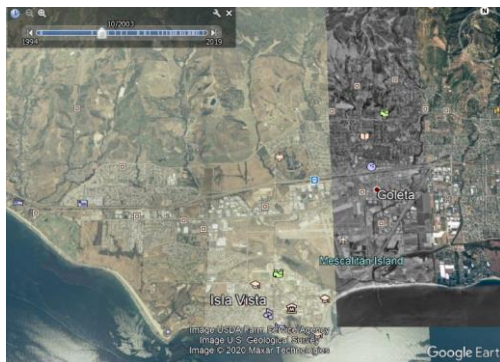
Launch Google Earth and navigate to a view that shows an extent that covers approximately the entire Santa Barbara metro area. Aim for an eye altitude around 20mi (see the “eye alt” value in the bottom right).

Once you have the desired extent and zoom level, click the “Historical Imagery” button in the top toolbar (it has a clock and an arrow icon). You will see a timeline pop up. Use the Arrows on the edges of the timeline to navigate backwards and forwards through time. You will want to wait for a few seconds after scrolling to a new date to allow the imagery to render properly.

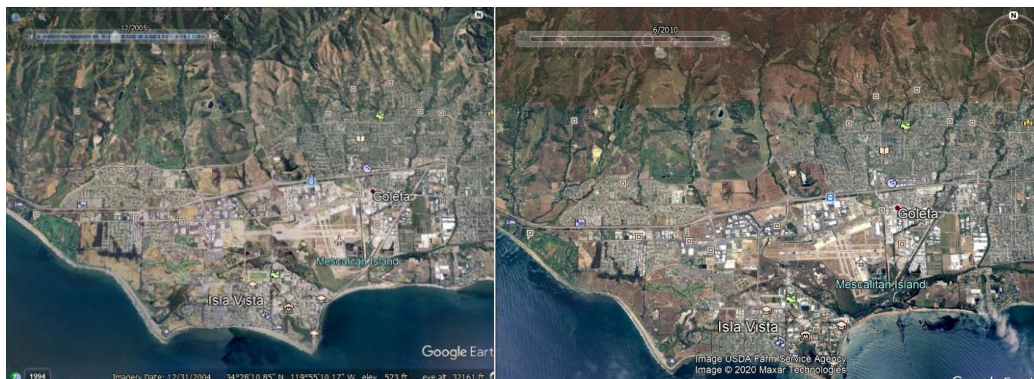
**Question 10:** What is the oldest image date that you are able to view? What is the most recent?  
(2 point)

*September 1994*

**Question 11:** Identify the Santa Ynez mountains that run East to West just to the North of campus, Goleta, and Santa Barbara. Starting from an image date near 2003, click forward through the historical imagery until you reach 2010. What are some major changes that you see over that period? What do you think was the cause? When did the changes you observe take place? Use annotated screenshots to help you answer this question. (4 points)

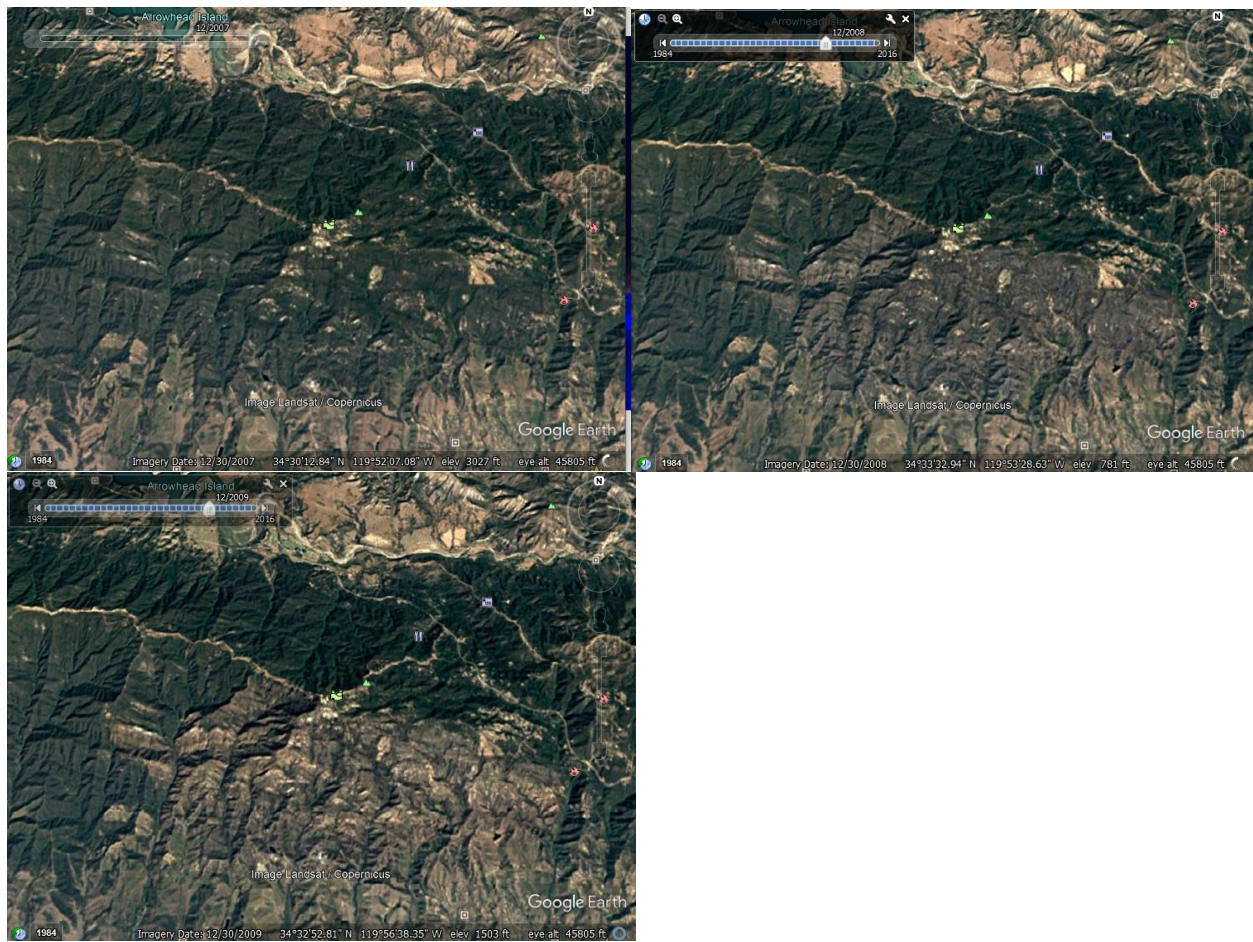


*2003-2004, Image sourcing change and resolution changes*



*2005-2010 Color filter variation, resolution improvements,*

Ian Hinds 1NOV2020



*2007-2009, Land cover change due to drought and fires, near gun range (centered)*